# MINES AND MINERAL DEPOSITS (EXCEPT FUELS) MEAGHER COUNTY, MONT.

BY ROBERT N. ROBY

* * * * * * * * * **Information Circular 7540**

MARCH 3, 1849

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

---

The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Information Circular 7540."

January 1950

# MINES AND MINERAL DEPOSITS (EXCEPT FUELS), MEAGHER COUNTY, MONT.

by

Robert N. Roby[1]

---

CONTENTS

| | Page |
|---|---|
| Introduction | 3 |
| Acknowledgments | 3 |
| Location and accessibility | 3 |
| Climate | 4 |
| Topography | 4 |
| History | 7 |
| Production | 7 |
| Geology | 9 |
| Labor supply and wage scales | 10 |
| Power | 10 |
| Trucking rates | 11 |
| Railroad freight rates on ores and concentrates | 11 |
| Smelter schedules | 12 |
| Metallic mines and mineral occurrences | 15 |
| General | 15 |
| Castle Mountain district | 15 |
| Cumberland | 17 |
| Broadway | 19 |
| Jumbo | 19 |
| Yellowstone | 20 |
| Great Eastern and Great Western | 21 |
| Homestake | 21 |
| Hidden Treasure | 22 |
| Solid Silver | 22 |
| Silver Spoon | 22 |
| Silver Star | 23 |
| Iron Chief | 23 |
| California and Hendricks | 24 |
| Blackhawk and Alice | 24 |
| Judge | 25 |
| Queen-Hensley | 25 |
| Top Lode (Copper Top) | 26 |
| Belle of the Castles | 26 |
| Willow Creek-Ringling | 27 |
| Alabama-Cleveland | 27 |
| Other properties | 28 |

---

[1] Mining engineer, Bureau of Mines, Albany Branch, Mining Division.

## CONTENTS (Cont'd.)

Page

Metallic mines and mineral occurrences (Cont'd.)
  Murray (Battle Creek) district........................ 28
    Stewart and Battle Creek.......................... 28
    Other properties.................................. 29
  Musselshell district................................. 29
    Copperopolis...................................... 29
    Jumbo (Lucky Boy) and New Deal (Boss)........... 30
    Clara Barton...................................... 30
    Montana Copper (Barnette)........................ 31
    Other properties.................................. 31
  Tenderfoot-Sheep Creek district...................... 31
    Copper State...................................... 32
    Ducolon-Potter.................................... 32
    Sheep Creek Iron.................................. 33
    Iron Mountain..................................... 34
    Lynn (High Tariff)................................ 34
    Gold placers...................................... 35
  Beaver Creek district................................ 35
    Snowbank.......................................... 36
    Bourbon........................................... 36
    Victory (Meteor).................................. 36
    Gold placers...................................... 37
Nonmetallic mineral occurrences........................ 38
References............................................. 40
Mineral Industry Survey tables (metallic mineral deposits) 41

## ILLUSTRATIONS

Fig. — Follows page

1. Index map, Meagher County, Mont. .................. 2
2. Generalized geologic map............................ 8
3. Geologic map of Castle Mountain mining district.... 8
4. Mineral Industry Survey map of Meagher County, showing location of metallic mineral deposits by symbol and reference number...................... 40

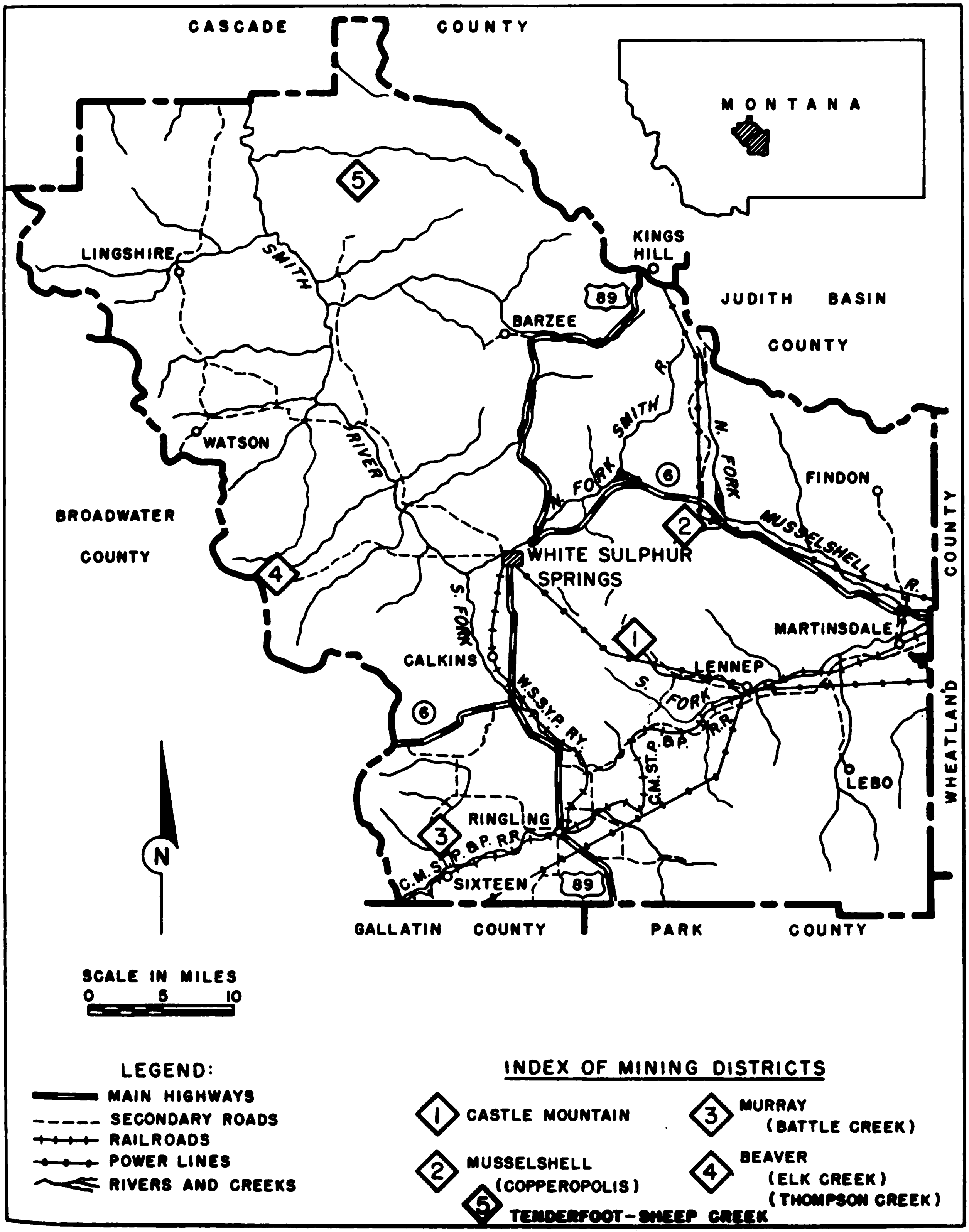

Figure 1. - Index map, Meagher County, Mont.

## INTRODUCTION

This report is one of a series based upon investigations made and being made within the Missouri River Basin in Montana by engineers of the Bureau of Mines, Albany Branch, Mining Division. These investigations are made primarily to provide preliminary information to Department of Interior agencies and others concerned with the planning of the proposed Federal power developments within the Missouri River Basin. The present report has been designed to permit public distribution of the factual data obtained.

The field investigations in Meagher County were made during 1948. Virtually all known metallic mineral occurrences within the county were investigated; some nonmetallic mineral deposits also were investigated. The investigations cannot be considered complete, however, because some long-inactive mines or prospects may have been missed. Most of the old mine and prospect openings are caved; many are completely inaccessible. Many of the claims located years ago have been abandoned; others have been relocated under different names and ownerships. Because of such conditions, much of the information regarding their development and operation necessarily has been obtained from Federal and State publications, supplemented by information provided by owners and local residents.

## ACKNOWLEDGMENTS

Compilation of this report was aided materially by the cooperation of the numerous mine and claim owners; their assistance is gratefully acknowledged.

Information concerning their respective activities, as related to the mining industry within Meagher County, was supplied by officials of the Anaconda Copper Mining Co., the American Smelting & Refining Co., the Montana Power Co., and the Chicago, Milwaukee, St. Paul, & Pacific Railroad.

Statistical information was provided by the U. S. Weather Bureau, Helena, Mont., and the Economics and Statistics Division, Bureau of Mines, Salt Lake City, Utah, and Washington, D. C.

Reports and unpublished manuscripts by the Montana State Bureau of Mines and Geology, the Federal Geological Survey, Federal Bureau of Mines, and others, have provided much valuable information. Citations to these works, as given in a list of references at the end of this report, are referred to by respective numbers within the body of the text.

## LOCATION AND ACCESSIBILITY

Meagher County embraces an area of 2,369 square miles in west-central Montana (fig. 1). The population is 2,239. White Sulphur Springs, the county seat, with a population of 858, is the largest town and the principal supply center within the county. Mining activity has centered within the five mining districts designated in figure 1.

Two highways serve the county - U. S. Highway 89 and Montana Route 6. County and side roads lead to the mining areas. The main line of the Chicago, Milwaukee, St. Paul, & Pacific Railroad crosses the southern part of the county, with a branch line from Ringling to White Sulphur Springs.

Distances by rail and highway between the main shipping points in Meagher County and the custom smelters in Montana are as follows:

| | American Smelting & Refining Co., East Helena | | Anaconda Copper Mining Co., Washoe sampler, Butte | | Anaconda Copper Mining Co. zinc plant, Great Falls | |
|---|---|---|---|---|---|---|
| Shipping point | Railroad | Highway | Railroad | Highway | Railroad | Highway |
| White Sulphur Springs........ | 109 | 72 | 152 | 136 | 211 | 105 |
| Lennep............ | 108 | 88 | 151 | 152 | 210 | 139 |
| Ringling.......... | 86 | 75 | 129 | 139 | 188 | 126 |

## CLIMATE

The climate of Meagher County in general is semiarid. The range between recorded minimum winter and maximum summer temperature is - 52° to 104°.

Snowfall is not excessive, except in the higher altitudes of the mountainous areas. Snow surveys made during March and April 1948 at Kings Hill, in the Little Belt Mountains, showed a depth of accumulated packed snow ranging from 40.3 to 47.3 inches. Wind velocities are not excessive. In general, the climatic conditions are not adverse to year-round mining.

Indicated climatological data at stations within and adjacent to Meagher County, as compiled from data provided by the U. S. Weather Bureau at Helena, Mont., are given in tables 1, 2, and 3.

## TOPOGRAPHY

The topography of Meagher County is characterized by four mountain ranges and by high intermountain valleys.

The county is bordered on the west by the crest of the Big Belt Mountain Range. These mountains rise abruptly from the long, wide valley of the Smith River at an altitude of about 5,000 feet to over 9,000 feet at some of the mountain summits. The Little Belt Mountain Range, which is east of the Smith River, is a broad mountain group whose peaks are lower and less spectacular than their neighbors to the west. Both ranges trend northwest. In the south-central part of the county, at the head of the Smith River Valley, is a mountainous mass known as the Castle Mountains. The main peak, whose summit of crags somewhat resembles a castle, reaches an altitude of 8,600 feet. Although a separate group, these mountains, together with long flanking ridges, tend to close the gap between the two Belt ranges. The northern end of the Crazy Mountain Range is in southeastern Meagher County, but most of the range is in Park and Sweet Grass Counties to the south.

TABLE 1. - Average monthly and annual precipitation, in inches at following U. S. Weather Bureau stations in and adjacent to Meagher County, Mont.1/

| Station | Findon | Martinsdale | White Sulphur Springs | Kings Hill Cascade County |
|---|---|---|---|---|
| Altitude, feet | 6,000 | 4,822 | 5,187 | 7,450 |
| Length of record, years | 16 | 15 | 11 | 8 |
| January | 0.89 | 1.05 | 0.58 | 1.98 |
| February | .63 | 0.74 | .60 | 2.27 |
| March | .79 | .78 | 1.00 | 1.93 |
| April | 1.47 | 1.28 | 1.12 | 2.09 |
| May | 2.66 | 2.24 | 1.75 | 3.11 |
| June | 3.30 | 3.21 | 2.76 | 4.56 |
| July | 2.29 | 1.48 | 1.44 | 1.94 |
| August | 1.60 | 0.80 | 1.16 | 1.97 |
| September | 1.81 | 1.36 | 1.27 | 2.11 |
| October | 0.91 | 0.76 | 1.06 | 1.98 |
| November | .77 | 1.02 | 0.68 | 2.21 |
| December | .73 | 0.65 | .88 | 2.40 |
| Annual average | 17.85 | 15.37 | 14.30 | 28.55 |

1/ Includes snowfall converted to water.

TABLE 2. - Average monthly and annual snowfall, in inches, at following U. S. Weather Bureau stations in and adjacent to Meagher County, Mont.

| Station | Findon | Martinsdale | White Sulphur Springs | Kings Hill Cascade County |
|---|---|---|---|---|
| Altitude, feet | 6,000 | 4,822 | 5,187 | 7,450 |
| Length of record, years | 13 | 10 | 19 | 8 |
| January | 14.7 | 11.0 | 7.4 | 31.4 |
| February | 10.9 | 6.0 | 5.9 | 42.5 |
| March | 13.1 | 9.3 | 8.2 | 31.8 |
| April | 9.5 | 7.6 | 6.4 | 24.8 |
| May | 1.8 | 3.1 | 2.8 | 9.0 |
| June | 0.7 | 0.0 | 0.6 | 8.6 |
| July | Trace | .0 | .1 | 0.0-0.2 |
| August | 0.0 | .0 | .0 | 0.0-0.2 |
| September | 2.3 | 1.0 | 2.4 | 9.4 |
| October | 7.8 | 2.1 | 6.2 | 18.2 |
| November | 7.8 | 9.9 | 5.8 | 35.6 |
| December | 11.9 | 5.2 | 9.1 | 39.1 |
| Annual average | 80.5 | 55.2 | 54.9 | 250.8 |

TABLE 3. - Average temperature data, in degrees Fahrenheit, at following U. S. Weather Bureau stations in and adjacent to Meagher County, Mont.

| Station | Findon | Martinsdale | White Sulphur Springs | Kings Hill Cascade County |
|---|---|---|---|---|
| Altitude, feet | 6,000 | 4,822 | 5,187 | 7,450 |
| Length of record, years | 12 | 10 | 20 | 7 |
| Annual average | 40.4 | 41.6 | 41.0 | 35.4 |
| Mean maximum: | | | | |
| January | 30.9 | 33.0 | 29.3 | 26.0 |
| July | 75.4 | 82.7 | 80.8 | 71.8 |
| Annual | 51.5 | 54.5 | 54.0 | 46.9 |
| Mean minimum: | | | | |
| January | 13.0 | 12.2 | 10.0 | 9.4 |
| July | 47.6 | 47.8 | 47.6 | 43.2 |
| Annual | 29.2 | 28.8 | 28.0 | 24.4 |
| Highest: | | | | |
| January | 56.0 | 54.0 | 64.0 | - |
| July | 96.0 | 103.0 | 99.0 | - |
| Annual | 96.0 | 104.0 | 99.0 | 90.0 |
| Lowest: | | | | |
| January | -37.0 | -40.0 | -42.0 | - |
| July | 31.0 | 32.0 | 30.0 | - |
| Annual | -37.0 | -52.0 | -42.0 | -42.0 |
| Latest date 32° or lower in spring | May 20 to June 24 | July 1 | May 11 to July 8 1/ | June 8 to June 23 1/ |
| Earliest date 32° or lower in fall | Aug. 1 to Oct. 5 | Aug. 9 | Aug. 5 to Sept. 29 1/ | Aug. 17 to Oct. 6 1/ |

1/ Below freezing temperature recorded in all months during some years.

Four drainage systems arise in the Castle Mountains and the adjoining highlands. These streams, all within the Missouri River Basin, head within a few miles of each other, but each flows out of the county in a different direction; all eventually enter the Missouri River many miles apart. The two most important streams within the county are the Musselshell River and the Smith River.

Much of the mountainous area of the county is covered by dense stands of lodgepole pine. The north slopes of many of the mountains are forested with fir and spruce. Vegetation in the open mountain parks and along lower mountain slopes consists mainly of grass. Excellent hay is grown along the river valleys.

Because of the short growing season (owing to the high altitude), few agricultural crops will mature. The chief industry in the county for many years has been sheep and cattle raising. Recently a pulpwood industry has been developed. About 50,000 cords of lodgepole pine are cut each year and shipped to paper mills in Wisconsin.

## HISTORY

The first lode mining within the present boundary of Meagher County was done at Copperopolis in 1867, when about 5 tons of copper ore was shipped to Swansea, Wales (11).[2] According to local reports, this was the first copper ore mined in Montana.

The Cumberland mine in the Castle Mountain district was discovered in 1884. The first shipment of silver-lead ore from the Cumberland mine, made in 1888, was hauled by mule and ox teams about 75 miles to Livingston, Mont., and shipped from there by rail to a smelter at Chicago, Ill. Exploitation of other mines in the Castle Mountain district soon followed, but the Cumberland mine remained the largest producer. Two small smelters were erected in the district and operated for a short time. For a while the mines of the Castle Mountain district were the largest producers of silver-lead ore in Montana. The heyday of the district was brief, for in 1892 most of the mines closed. The substantial drop in the market price of silver and lead in 1892-93 is given as the cause for closing the mines, although high freight rates and the depletion of available profitable reserves in the Cumberland mine probably were equally responsible. Only small-scale sporadic operations have been conducted in the district during the past 50 years.

The period of greatest activity for the lode mines of the Murray and Musselshell districts was during 1916 and 1917. Production was small and consisted mostly of copper ore mined from narrow veins in the Belt shales.

Gold placers in Meagher County, with few exceptions, are situated on the eastern slope of the Big Belt Mountains along eastward-flowing creeks tributary to the Smith River. The area designated as the Beaver Creek district is just across the divide from the famous Confederate, Avalanche, and White Gulches in Broadwater County that produced about 17 million dollars in gold shortly after their discovery in 1864.

Placer gold was discovered in Thompson Creek in 1865. By 1870, production from placers along this creek is estimated to have been about $50,000 (4). Production records other than those based on estimates are not available for individual placers in Meagher County before 1900. No placer-gold production has been reported since 1945.

## PRODUCTION

Table 4 shows the Meagher County production records for gold, silver, copper, lead, and zinc since 1883, as provided by the Economics and Statistics Branch of the Bureau of Mines, Salt Lake City, Utah. The major part of the lead and silver production from the county is credited to the Cumberland mine in the Castle Mountain district. A substantial production of placer gold was made prior to 1883, but production records are not available.

---

[2] Numbers in parentheses refer to items in the bibliography.

TABLE 4. - Mine production of gold, silver, copper, lead, and zinc in Meagher County, Mont., for years 1883-1947, in terms of recoverable metals

| Year | Producing mines | | Ore sold or treated (short tons) | Gold-Fine ounces | | | Silver-Fine ounces | | | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lode | Placer | | Lode | Placer | Value Lode & placer | Lode | Placer | Value Lode & placer | Pounds | Value | Pounds | Value | Pounds | Value | |
| 1883 | 1/ | 1/ | 1/ | 1/ | 1/ | $60,000 | 1/ | 1/ | $17,171 | --- | --- | 1/ | 1/ | --- | --- | $77,171 |
| 1884 | do | do | do | do | do | 70,000 | do | do | 49,365 | --- | --- | do | do | --- | --- | 119,365 |
| 1885 | do | do | do | do | do | 374,284 | do | do | 39,593 | --- | --- | do | do | --- | --- | 413,877 |
| 1886 | do | do | do | do | do | 79,780 | do | do | 5,940 | --- | --- | do | do | --- | --- | 85,720 |
| 1887 | do | do | do | do | do | 81,523 | do | do | 19,600 | --- | --- | do | do | --- | --- | 101,123 |
| 1888 | do | do | do | do | do | 10,000 | do | do | 72,704 | --- | --- | do | do | --- | --- | 82,704 |
| 1889 | do | do | do | do | do | 5,510 | do | do | 106,047 | --- | --- | do | do | --- | --- | 111,557 |
| 1890 | do | do | do | do | do | 43,459 | do | do | 26,250 | --- | --- | 500,000 | 22,400 | --- | --- | 92,109 |
| 1891 | do | do | do | do | do | 116,179 | do | do | 422,545 | 15,000 | 1,913 | 10,551,000 | 458,968 | --- | --- | 999,605 |
| 1892 | do | do | do | do | do | 41,216 | do | do | 259,929 | --- | --- | 3,279,811 | 131,192 | --- | --- | 432,337 |
| 1893 | do | do | do | do | do | 136,343 | do | do | 780,295 | --- | --- | 1/ | 1/ | --- | --- | 916,638 |
| 1894 | do | do | do | do | do | 82,595 | do | do | 764,121 | --- | --- | 98,094 | 3,271 | --- | --- | 849,987 |
| 1895 | do | do | do | do | do | 94,147 | do | do | 181,596 | --- | --- | 383,385 | 12,268 | --- | --- | 288,011 |
| 1896 | do | do | do | do | do | 64,139 | do | do | 339,775 | --- | --- | 501,620 | 15,049 | --- | --- | 418,963 |
| 1897 | do | do | do | do | do | 5,842 | do | do | 89,128 | --- | --- | 7,091,591 | 255,297 | --- | --- | 350,267 |
| 1898 | do | do | do | do | do | 3,179 | do | do | 99,207 | --- | --- | 6,000,000 | 228,000 | --- | --- | 330,386 |
| 1899 | do | do | do | do | do | 1/ | do | do | 1/ | 1/ | 1/ | 1/ | 1/ | 1/ | 1/ | 1/ |
| 1900 | do | do | do | do | do | do | do | do | do | do | do | do | do | do | do | do |
| 1901 | 2 | --- | 680 | 1,016.00 | --- | 21,000 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 21,000 |
| 1902 | 4 | --- | 661 | 37.00 | --- | 765 | 1,610 | --- | 854 | 22,164 | 1,646 | 50,000 | 1,750 | --- | --- | 5,015 |
| 1903 | 2 | --- | 1,550 | 170.00 | --- | 3,511 | 95 | --- | 48 | --- | --- | 15,000 | 300 | --- | --- | 3,859 |
| 1904 | 1 | --- | 1,000 | 50.00 | --- | 1,034 | 2,000 | --- | 1,144 | 75,000 | 9,617 | --- | --- | --- | --- | 11,795 |
| 1905 | --- | 2 | --- | --- | 107.51 | 2,222 | --- | 11 | 6 | --- | --- | --- | --- | --- | --- | 2,228 |
| 1906 | --- | 2 | --- | --- | 84.39 | 1,745 | --- | 11 | 7 | --- | --- | --- | --- | --- | --- | 1,752 |
| 1907 | 1 | 2 | 102 | --- | 46.78 | 967 | 87 | 2 | 58 | 40,800 | 8,160 | --- | --- | --- | --- | 9,185 |
| 1908 | 4 | 2 | 176 | 5.66 | 64.92 | 1,459 | 432 | 5 | 231 | 35,503 | 4,686 | 11,816 | 496 | --- | --- | 6,872 |
| 1909 | 3 | 1 | 92 | 22.16 | 12.53 | 717 | 25 | 1 | 14 | 30,805 | 4,005 | --- | --- | --- | --- | 4,736 |
| 1910 | 2 | 1 | 51 | 5.08 | 7.01 | 250 | 13 | 1 | 8 | 12,730 | 1,617 | --- | --- | --- | --- | 1,875 |
| 1911 | 3 | 1 | 67 | 4.30 | 1.84 | 127 | 92 | --- | 49 | 10,862 | 1,358 | 12,544 | 564 | --- | --- | 2,098 |
| 1912 | 2 | 4 | 33 | .58 | 23.90 | 506 | 1,003 | 2 | 618 | 1,875 | 309 | 8,235 | 371 | --- | --- | 1,804 |
| 1913 | 1 | 3 | 5 | --- | 37.44 | 774 | --- | 6 | 4 | 1,333 | 207 | --- | --- | --- | --- | 985 |
| 1914 | 2 | 2 | 26 | --- | 9.00 | 186 | 3 | 2 | 3 | 2,654 | 353 | --- | --- | 12,308 | 628 | 1,170 |
| 1915 | 1 | 2 | 13 | --- | 10.88 | 225 | 3 | 2 | 2 | 3,430 | 600 | --- | --- | --- | --- | 827 |
| 1916 | 5 | 1 | 2,002 | .63 | 2.32 | 61 | 282 | --- | 186 | 236,545 | 58,190 | --- | --- | --- | --- | 58,437 |
| 1917 | 7 | 2 | 873 | .38 | 29.95 | 627 | 634 | 4 | 526 | 80,871 | 22,078 | 26,994 | 2,322 | --- | --- | 25,553 |
| 1918 | 5 | --- | 157 | .19 | --- | 4 | 17 | --- | 17 | 49,059 | 12,118 | --- | --- | --- | --- | 12,139 |
| 1919 | 8 | --- | 97 | 69.25 | --- | 1,431 | 500 | --- | 560 | 12,946 | 2,408 | 12,028 | 637 | --- | --- | 5,036 |
| 1920 | 2 | 1 | 63 | 1.02 | 7.40 | 174 | 7 | 1 | 9 | 13,984 | 2,573 | --- | --- | --- | --- | 2,756 |
| 1921 | --- | 2 | --- | --- | 11.42 | 236 | --- | 3 | 3 | --- | --- | --- | --- | --- | --- | 239 |
| 1922 | 4 | 2 | 64 | 89.88 | 28.93 | 2,456 | 143 | 6 | 149 | 5,342 | 721 | --- | --- | --- | --- | 3,326 |
| 1923 | 4 | 1 | 117 | 53.64 | 28.98 | 1,708 | 72 | 4 | 62 | 12,776 | 1,878 | 9,217 | 645 | --- | --- | 4,293 |
| 1924 | 3 | 2 | 1,073 | 8.80 | 12.72 | 445 | 923 | 3 | 620 | 1,235 | 162 | 129,622 | 10,370 | --- | --- | 11,597 |
| 1925 | 3 | 3 | 170 | 26.41 | 9.68 | 746 | 153 | 1 | 107 | --- | --- | 13,715 | 1,193 | --- | --- | 2,046 |
| 1926 | 6 | 1 | 2,870 | --- | 2.47 | 51 | 2,072 | --- | 1,293 | 11,948 | 1,673 | 413,001 | 33,040 | --- | --- | 36,057 |
| 1927 | 3 | 1 | 1,412 | .05 | 1.55 | 33 | 699 | --- | 396 | 15,148 | 1,984 | 212,152 | 13,366 | --- | --- | 15,779 |
| 1928 | 1 | --- | 39 | --- | --- | --- | 74 | --- | 43 | 271 | 39 | 1,334 | 77 | 20,399 | 1,244 | 1,403 |
| 1929 | 2 | --- | 27 | --- | --- | --- | 6 | --- | 3 | 6,606 | 1,163 | --- | --- | --- | --- | 1,166 |
| 1930 | --- | 1 | --- | --- | 2.51 | 52 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 52 |
| 1931 | 3 | 6 | 28 | 27.28 | 39.04 | 1,371 | 11 | 5 | 5 | 192 | 17 | --- | --- | --- | --- | 1,393 |
| 1932 | 1 | 7 | 12 | 16.30 | 64.68 | 1,674 | 7 | 7 | 4 | 64 | 4 | --- | --- | --- | --- | 1,682 |
| 1933 | 3 | 14 | 78 | 37.54 | 96.36 | 2,768 | 160 | 3 | 57 | 94 | 6 | 649 | 24 | --- | --- | 2,855 |
| 1934 | 1 | 5 | 110 | 59.80 | 37.08 | 3,386 | 17 | 3 | 13 | 200 | 16 | --- | --- | --- | --- | 3,415 |
| 1935 | 1 | 10 | 58 | 32.60 | 73.97 | 3,730 | 25 | 18 | 31 | 36 | 3 | --- | --- | --- | --- | 3,764 |
| 1936 | 2 | 11 | 26 | 24.80 | 424.20 | 15,715 | 9 | 49 | 45 | --- | --- | --- | --- | --- | --- | 15,760 |
| 1937 | 5 | 20 | 58 | 51.00 | 177.00 | 7,980 | 106 | 22 | 99 | 1,000 | 121 | 4,000 | 236 | --- | --- | 8,436 |
| 1938 | 1 | 11 | 14 | 24.00 | 341.00 | 12,775 | 3 | 68 | 46 | --- | --- | --- | --- | --- | --- | 12,821 |
| 1939 | 2 | 16 | 10 | --- | 395.00 | 13,825 | 31 | 81 | 76 | 1,500 | 156 | 1,532 | 72 | --- | --- | 14,129 |
| 1940 | 1 | 19 | 20 | 24.00 | 931.00 | 33,553 | 7 | 211 | 155 | --- | --- | --- | --- | --- | --- | 33,708 |
| 1941 | 1 | 18 | 5 | 4.00 | 224.00 | 7,980 | 21 | 45 | 47 | 400 | 47 | --- | --- | --- | --- | 8,074 |
| 1942 | --- | 6 | --- | --- | 62.00 | 2,170 | --- | 7 | 5 | --- | --- | --- | --- | --- | --- | 2,175 |
| 1943 | 2 | --- | 75 | --- | --- | --- | 1,035 | --- | 736 | 1,200 | 156 | 50,600 | 3,795 | --- | --- | 4,687 |
| 1944 | 1 | 1 | 108 | --- | 3.00 | 105 | 810 | --- | 576 | --- | --- | 44,300 | 3,544 | --- | --- | 4,225 |
| 1945 | --- | 1 | --- | --- | 2.00 | 70 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 70 |
| 1946 | 1 | --- | 48 | 1.00 | --- | 35 | 193 | --- | 156 | --- | --- | 15,000 | 1,635 | 1,500 | 183 | 2,009 |
| 1947 | 1 | --- | 6 | --- | --- | --- | 53 | --- | 48 | --- | --- | 2,500 | 360 | --- | --- | 408 |
| 1883-1947 | | | 14,076 | 1,863.35 | 3,414.46 | $1,418,845 | 13,433 | 584 | $3,282,385 | 703,573 | $139,984 | 29,439,740 | $1,201,242 | 34,207 | $2,055 | $6,044,511 |

1/ Not available

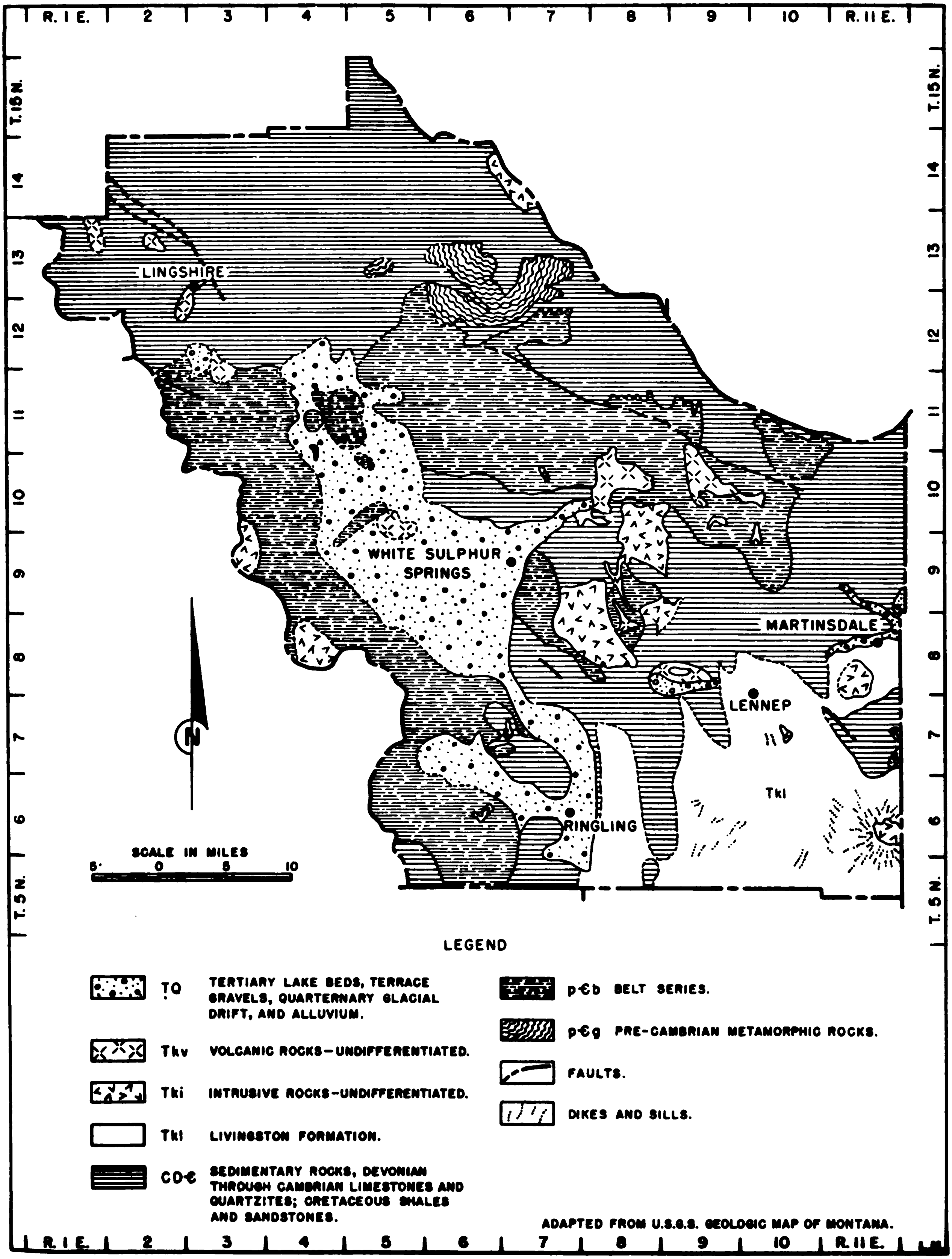
R. I E.
2
3
4
5
6
7
8
9
10
R. II E.
T. 15 N.
14
13
12
11
10
9
8
7
6
T. 5 N.
LINGSHIRE
WHITE SULPHUR SPRINGS
MARTINSDALE
LENNEP
RINGLING
Tkl
N
SCALE IN MILES
5 0 5 10
LEGEND
TQ TERTIARY LAKE BEDS, TERRACE GRAVELS, QUARTERNARY GLACIAL DRIFT, AND ALLUVIUM.
Tkv VOLCANIC ROCKS—UNDIFFERENTIATED.
Tki INTRUSIVE ROCKS-UNDIFFERENTIATED.
Tkl LIVINGSTON FORMATION.
CD€ SEDIMENTARY ROCKS, DEVONIAN THROUGH CAMBRIAN LIMESTONES AND QUARTZITES; CRETACEOUS SHALES AND SANDSTONES.
p€b BELT SERIES.
p€g PRE-CAMBRIAN METAMORPHIC ROCKS.
FAULTS.
DIKES AND SILLS.
ADAPTED FROM U.S.G.S. GEOLOGIC MAP OF MONTANA.

Figure 2. - Generalized geologic map of Meagher County, Mont.

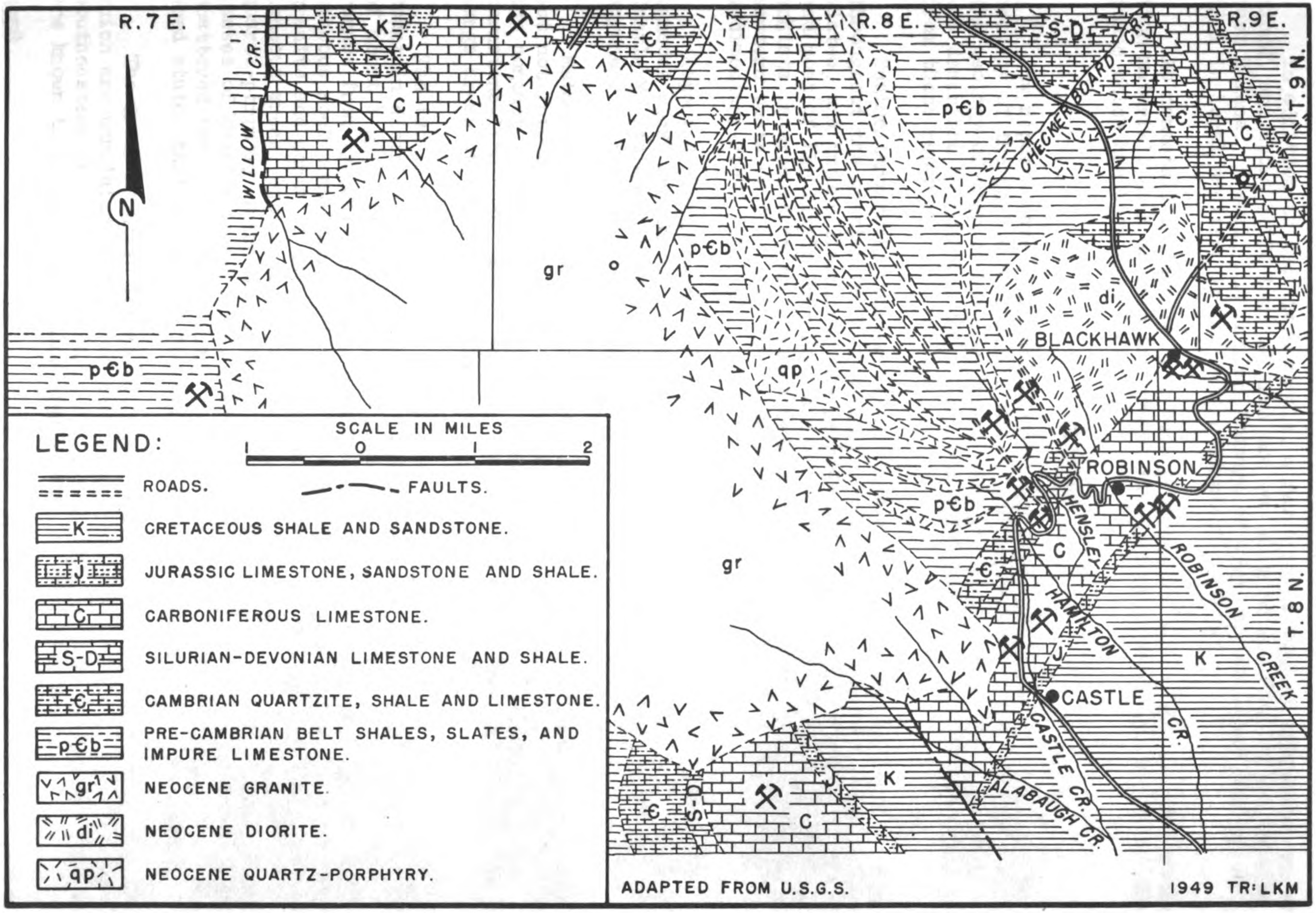
R.7E.
R.8E.
R.9E.
T.9N.
T.8N.
N
WILLOW CR.
CHECMER BOARD CR.
ROBINSON CREEK
HENSLEY
HAMILTON
CASTLE CR.
ALABAUGH CR.
CR.
BLACKHAWK
ROBINSON
CASTLE
K
J
C
€
S-D
p€b
gr
di
qp
LEGEND:
SCALE IN MILES
1 0 1 2
ROADS.
FAULTS.
K CRETACEOUS SHALE AND SANDSTONE.
J JURASSIC LIMESTONE, SANDSTONE AND SHALE.
C CARBONIFEROUS LIMESTONE.
S-D SILURIAN-DEVONIAN LIMESTONE AND SHALE.
€ CAMBRIAN QUARTZITE, SHALE AND LIMESTONE.
p€b PRE-CAMBRIAN BELT SHALES, SLATES, AND IMPURE LIMESTONE.
gr NEOCENE GRANITE.
di NEOCENE DIORITE.
qp NEOCENE QUARTZ-PORPHYRY.
ADAPTED FROM U.S.G.S.
1949 TR:LKM

Figure 3. - Geologic map of Castle Mountain mining district, Meagher County, Mont.

In addition to the above metals, a few hundred tons of manganese ore was mined, and about 7,000 tons of iron ore was shipped for flux to the smelter at East Helena. A small but unknown tonnage of iron ore was mined for use as flux in local smelters in the Castle Mountain district.

No nonmetallic minerals have been produced in the county except construction materials such as sand and gravel and perhaps a small amount of building stone which has been used locally.

## GEOLOGY

Few reports have been published on the geology of Meagher County. The geology of the Castle Mountain district was described by Weed in 1896 (13). The geology of most of Meagher County east of the Big Belt Mountains also was described by Weed in 1898 (14). The following has been briefed mainly from these reports.

Sedimentary rocks ranging in age from pre-Cambrian to Neocene are exposed throughout the greater part of Meagher County. The pre-Cambrian Belt shales, slates, and impure limestones are prominent throughout the Big Belt Mountains and most of the Little Belt Mountains. A small area of Archean gneisses and schists is exposed in the northeastern part of the county. The northern and eastern parts of the county are underlain by Cambrian through Cretaceous sedimentary rocks (fig. 2).

Repeated mountain-forming forces and local intrusion by a variety of igneous rocks arched and folded the sedimentary beds. According to Weed, the Castle Mountains comprise the greatest variety of sedimentary formations known anywhere in the Rocky Mountain region (14).

Metamorphism of the sedimentary rocks near igneous intrusions was general but not intensive. The altered zone usually extends less than 1,000 feet from the contact. The Belt shales near contacts are baked into tough, dense, hornstone-like rock; the limestones are bleached or altered to marble. No large areas of tactite or silicified limestone were noted.

The two largest areas of igneous rocks in the county are in the Castle Mountain district. The Castle Mountain granite, which is exposed over an area of about 4 by 8 miles, as shown in figure 3, is the larger intrusive body. It ranges from typical granite to granite-porphyry. A second but smaller area of igneous rock consisting of diorite is exposed northeast of the Castle Mountain granite and north of the old town of Robinson. In the region between the two igneous areas, especially in the upturned Belt shales, are many sheets of quartz-porphyry which undoubtedly are related directly to the larger nearby masses of granite and diorite. Other porphyritic dikes and sheets are widely scattered throughout the county; their origin and relationship are less obvious. Weed states that the age of the Castle Mountain intrusive is late Eocene.

The Crazy Mountain intrusives and a few other minor intrusives, all of which are unrelated to those of the Castle Mountain district, occur in the southeastern part of the county. No mineral occurrences of economic importance are known to be present in these formations in Meagher County.

Volcanic activity has occurred at a number of places in the county, as evidenced by rhyolite flows, tuff, and volcanic ash. Most of the ash resulting from volcanic activity in the Castle Mountain district has been removed by erosion. The Neocene lake beds below White Sulphur Springs consist largely of water-deposited volcanic ash.

## LABOR SUPPLY AND WAGE SCALES

Most mines that have been active during recent years have been operated either by leasers who did their own work or by men who worked on an interest or "grub-stake" basis. Miners and operating personnel required by mines that may develop would have to be obtained largely from other areas within the State.

Wage scales in most mining districts of Montana are influenced largely by those prevailing at Butte, Mont. The following table gives some of the basic wages in effect at Butte during the fall of 1948.

| | Base for 8-hour shift |
|---|---|
| Miners | $11.11 |
| Shaft miners | 11.61 |
| Timbermen | 11.11 |
| Underground shovelers | 11.11 |
| Underground mucking machine operators | 11.11 |
| Hoistmen | 12.36 |
| Blacksmiths | 11.70 |
| Surface labor | 10.61 |
| Truck driver, 2- to 5-ton trucks | 11.45 |
| Truck driver, 5-ton trucks | 11.70 |
| Millmen | 11.36 |

## POWER

Two 110,000-volt power lines cross the eastern and southern parts of Meagher County. One line from Great Falls to Twodot and Billings, Mont., crosses the eastern part of the county but supplies no power to local county points. Another 110,000-volt line along the right of way of the Chicago, Milwaukee, St. Paul & Pacific Railroad furnished power to the electrified railway system. A branch line from the transformer station on the railroad at Loweth, Mont., supplies power to White Sulphur Springs (fig. 1).

The mining districts of the county never have been supplied with electric power. Past mining operations have used steam and gasoline engines. The center of the Castle mining district is approximately 7 miles from the transformer station at Loweth. No difficulty should be experienced in constructing and maintaining a power line into the district.

Electric power is provided by the Montana Power Co. to consumers in Montana under the following schedule (GS-44), which is based on a sliding scale for kilowatt-hours actually consumed plus a charge based on peak kilowatt demand.

## Montana Power Co. power rates, schedule GS-44

### Rate: Net monthly bill

$0.75 for the first 12 kw-hr. or less.
.035 per kw.-hr. for the next 288 kw.-hr.
.025 per kw.-hr. for the next 1,500 kw.-hr.
.015 per kw.-hr. for the next 3,200 kw.-hr.
.009 per kw.-hr. for the next 15,000 kw.-hr.
.007 per kw.-hr. for the next 200 kw.-hr. per kw. of demand.
.005 per kw.-hr. for all additional kw.-hr.

### Plus demand charge:

| | |
|---|---|
| First 10 kw. .................... | No charge |
| Next 20 kw. ..................... | $0.95 per kw. of demand |
| All additional kw. .............. | .75 per kw. of demand |

## TRUCKING RATES

Trucking rates vary according to the condition of the roads, location, and altitude of the mine and the size and regularity of the shipments. No current rates for hauling ore in Meagher County are available because of present inactivity. Trucking charges on a one-car shipment of ore made from a mine in an adjoining county are given as an indication of present costs. This ore was trucked 20 miles to the railroad from a mine at an altitude of about 7,500 feet. The first 3 miles of the road from the mine was constructed recently and in poor condition; the remaining 17 miles are by dirt road of fair quality. The charges for hauling the ore were $10 per ton, or 50 cents a ton-mile. The same truck operator estimated that with improved road conditions in the spring, the ore could be trucked to the railroad for a 35 cents a ton-mile. A trucking firm in Helena, Mont., estimates about 10 cents a ton-mile for trucking over paved roads and about 25 cents a ton-mile for ore trucked over good-quality mountain roads.

## RAILROAD FREIGHT RATES ON ORES AND CONCENTRATES

Freight rates on ores and concentrates per ton, in 30-ton minimum carload lots, from railroad points in Meagher County to smelters in Montana, in effect October 1948, were as follows:

### Chicago, Milwaukee, St. Paul, & Pacific Railroad

| Value per ton, not exceeding.. | $15 | $25 | $35 | $50 | $100 | Over $100 |
|---|---|---|---|---|---|---|
| To A.S. & R. Co. smelter, East Helena, Mont., from: | | | | | | |
| White Sulphur Springs.. | $3.60 | 3.86 | 4.46 | 4.91 | 5.20 | 6.10 |
| Lennep.................. | 3.86 | 3.86 | 4.46 | 4.91 | 5.20 | 6.10 |
| Ringling[1]............. | | | | | | |
| To Washoe sampler, A.C.M. Co., Butte, Mont., from: | | | | | | |
| White Sulphur Springs.. | 3.60 | 4.52 | 5.25 | 5.76 | 6.11 | 7.73 |
| Lennep.................. | 3.86 | 3.86 | 4.46 | 4.91 | 5.20 | 6.10 |
| Ringling................ | 3.58 | 3.58 | 4.16 | 4.61 | 4.91 | 5.95 |

[1] No established rate.

Shipments made from railroad points in Meagher County to the A. S. & R. smelter at East Helena are transferred from the Chicago, Milwaukee, St. Paul, & Pacific Railroad to the Northern Pacific Railroad at Lombard, Mont.

No freight rates have been established between rail points in Meagher County on the Chicago, Milwaukee, St. Paul, & Pacific Railroad and the Anaconda Copper Mining Co. zinc plant at Great Falls, Mont.

## SMELTER SCHEDULES

The following summarized schedules for ores and concentrates at smelters in Montana were in effect October 1, 1948. These schedules are useful in preliminary calculations only. Applicable schedules usually are established only after representative samples submitted by the prospective shipper have been analyzed.

### East Helena Smelter-American Smelting & Refining Co., copper-lead-gold-silver ores and concentrate

Payments for metals:

Gold-minimum paid for, 0.03 ounce per ton.

| Ounces per ton. | Per ounce. |
|---|---|
| 0.03 to 3.0 | $31.81825 |
| Plus 3.0 | 32,31825 |

Silver-pay for 95 percent at average of the Handy & Harman New York quotations, or Mint price, less minimum deduction one Troy ounce per dry ton.

Lead-If 3 percent or over by wet assay, deduct from wet assay 1.5 units (a unit is 20 pounds) and pay for 90 percent of the remaining lead at the average of the daily published A. S. & R. Co. quotations for common desilverized domestic lead for delivery in New York City, less 1.8 cents per pound of lead accounted for.

Copper-If 1 percent or over, deduct from wet copper assay 1 unit and pay for 100 percent of the remaining copper at daily net Refinery quotations for electrolytic cathodes as published in E. & M. J. Metal & Mineral Markets of New York; less a deduction of 6 cents per pound of copper accounted for.

Deductions:

Base charge-$8.00 per net dry ton for treatment of ores and concentrates having a settlement lead content of 20 percent or less; deduct 10 cents per ton for each unit of lead over 20 percent, fractions in proportion; $7.00 per ton for those having no payable lead content.

Arsenic and antimony (combined)-2 percent free. Excess charged at 50 cents per unit, fractions in proportion. 0.1 percent of lead content by wet assay allowed free, excess charged at 50 cents per pound.

Zinc-10 percent free. Excess charged at 30 cents per unit, fractions in proportion.

Sampling and assaying-Charge $10 per lot when less than $200 value and $20 per lot when over $200 value for shipment of less than 5 tons dry weight. Charge $5 per lot when less than $200 value and $10 per lot when over $200 value for shipments less than 10 tons dry weight.

## Washoe Sampler-Anaconda Copper Mining Co., Butte, Mont., copper, gold, and silver ores and concentrate

Payment for metals:

Copper-96 percent of copper content, with minimum deduction of 10 pounds per ton, at E. & M. J. average price of electrolytic copper for week ending Wednesday preceding date of sampling, less 2.5 cents per pound.

Silver-95 percent of silver content, with minimum deduction of 1 ounce per ton at Government price less 2 cents per ounce. Silver not eligible for Government price will be paid for at open-market quotation, as quoted by E. & M. J.

Gold-95 percent of gold content, with minimum deduction of 0.01 ounce per ton, at $20 per ounce, plus 90 percent of premium in excess of $20.67 per ounce. (This is equivalent to paying for 100 percent at $31.81825 per ounce.)

Treatment charge, f.o.b. Washoe sampler, Butte, Mont.:

Base charge - $4 per ton.
Add 10 percent of sum of metal payments in excess of $15 per dry ton.
Add 12 cents for each 1 percent iron (Fe).
Deduct 2.5 cents for each 1 percent of silica ($SiO_2$) in excess of alumina ($Al_2O_3$).
Maximum total treatment charge to be $5.50 per dry ton.

In case company elects to have shipments made direct to the smelter at Anaconda for sampling, the base treatment charge will be $3.75 per dry ton, f.o.b., Anaconda Reduction Works, Anaconda, Mont., with maximum total treatment charge of $5.25 per dry ton. Lots of less than 10 tons will be assessed an extra sampling charge of $5 flat on each lot.

## Great Falls and Anaconda Electrolytic zinc plants, Anaconda Copper Mining Co., Anaconda, Mont., zinc concentrates

The Anaconda Copper Mining Co. advises that it does not have any published or open schedules for the treatment of zinc ores and zinc concentrates at its Anaconda and Great Falls electrolytic zinc plants. Because of certain impurities, which complicate the treatment in these plants, only certain types and grades of zinc concentrates are acceptable. The acceptability is decided after complete analysis of a representative sample of the zinc concentrates involved. If satisfactory, terms of purchase will then be offered.

Terms of purchase of acceptable zinc concentrates by these zinc plants are indicated by the following, which pertain to some shipments of zinc concentrates made during 1948.

Payments for metals in zinc concentrates:

Zinc-------- Eighty percent (80%) of zinc content at St. Louis price for prime western zinc.

Lead-------- Eighty percent (80%) of lead content in excess of 3 percent, at New York price, less 2 cents per pound.

Silver------ Eighty percent (80%) if 1.0 ounce per ton or over.

Gold-------- One hundred percent (100%) if 0.01 ounce per ton or over, at $27.024 per ounce.

Other metals-No payment shall be made for any other metal or metals contained in concentrates, and such metals shall be the property of the Anaconda Company.

Prices for zinc and lead shall be those quoted by Engineering & Mining Journal for week of arrival of concentrates at plants of Anaconda Company.

Treatment charge:

Base treatment charge shall be thirty dollars ($30.00) per dry ton of concentrates delivered and accepted, based on St. Louis price of prime western zinc of ten and one-half cents (10-1/2) per pound; a cost of labor in the zinc plants of the Anaconda Copper Mining Co. at Anaconda and Great Falls, Mont., based at $11.40 per 8-hour day, with the addition to or subtraction from said base treatment charge per dry ton of concentrates of one cent (1.0¢) for each one cent (1.0¢) increase or decrease in said cost of 8-hour day employment; a lead content of three percent (3%); and arsenic plus antimony content of 0.125 percent.

There shall be added to, or subtracted from, said base treatment charge, one dollar (1.00) per dry ton of concentrates for each one cent (1.0¢) per pound increase or decrease, in the price of Prime Western zinc at St. Louis above or below ten and one-half (10-1/2¢) per pound, fractions proportionately. Fifty cents (50¢) per dry ton of concentrates shall be added to said treatment charge for each one percent (1%) lead below three percent (3%) in such concentrates, fractions in proportion. Twenty-five cents (25¢) per dry ton of concentrates shall be added for each one percent (1%) of insoluble material plus iron. Twenty cents (20¢) per dry ton of concentrates shall be added for each 0.10 percent arsenic plus antimony in excess of 0.125 percent.

## METALLIC MINES AND MINERAL OCCURRENCES

### General

Mining activity in Meagher County since about 1900 has comprised only intermittent small-scale operations. Mine production for the past 48 years has averaged less than 300 tons of ore a year. During the summer of 1948, a little prospecting and developing was done at one property. In the fall of the same year, one hole was diamond-drilled at the Cumberland mine and one hole was drilled at the Yellowstone mine, both in the Castle Mountain district.

Meagher County now has five mining districts, as shown in figure 1. The more important metallic mineral-bearing deposits are described under the various district headings. The location of the mines and prospects investigated is shown by symbol and reference number on the Minerals Industry Survey map at the end of this report. The symbol on the map indicates the predominant metal or metals in the deposits; the number refers to the individual deposits on which summarized data are given in the table accompanying the map.

### Castle Mountain District

The Castle Mountain district embraces all of the Castle Mountain Range, an area of about 80 square miles. Most of the mines and prospects are near the old towns of Castle, Robinson, and Blackhawk, on the southeast slope of the range, within an area of about 10 square miles.

The district is about midway between White Sulphur Springs and Lennep; it is accessible by mountain roads from either of these towns (fig. 1). These roads, together with branch roads and trails, lead to the various mines and prospects. The mountain roads are used infrequently but are passable to automobiles and trucks in dry weather. Little difficulty would be experienced in improving and maintaining these roads.

Most of the mines in the district are at altitudes ranging from 6,000 to 7,000 feet. In general, the mountains are rounded and mature, although some have steep slopes.

Timber for mine purposes is available locally. Many of the mountain slopes are forested with spruce, fir, and lodgepole pine. Water sufficient for normal mining and milling may be obtained from any of several creeks in the district.

The Cumberland mine, which is credited with most of the district's metal production, was discovered by J. E. Hensley and his two brothers in 1884. The discovery of the Yellowstone, Jumbo, Blackhawk, and many other mines soon followed. News of the discoveries spread and attracted many people in search of fortunes. The towns of Castle, Robinson, and Blackhawk grew rapidly. The population of Castle at one time was about 1,500; it had a newspaper, a bank, two blacksmith shops, and several stores.

Two smelters were erected in the district; the first lead bullion was produced in August 1888. Coke for the smelters and all supplies and equipment were hauled 75 miles from Livingston, Mont., by ox or mule teams. Lead bullion was hauled in wagons to Livingston and shipped from there by railroad to eastern refineries. Because of high costs, only the highest-grade ore could be mined and smelted at a profit. The mines of the Castle Mountain district, however, were for a few years among the largest producers of lead ore in Montana. The drop in the market price of silver in 1892-93 apparently caused most of the mines to close. For the past 50 years, the only mining in the district has been done at a few small-scale leasing operations on dumps and in shallow workings.

Mineral-production records by districts in Meagher County are not available for years prior to 1932. It is known, however, that virtually all of the 29,500,000 pounds of lead and 4,250,000 ounces of silver produced in Meagher County came from the Castle Mountain district. The district also has produced a small but unknown amount of gold, zinc, copper, and manganese as well as a small tonnage of iron ore for use as smelter flux. Since 1932, the Castle Mountain district has made a recorded production of only 242 tons of ore containing the following amounts of metal:

| | |
|---|---|
| Gold...................... | 1.0 ounce |
| Silver.................... | 2,122 ounces |
| Lead...................... | 113,932 pounds |
| Copper.................... | 1,500 pounds |
| Zinc...................... | 1,500 pounds |

All of the ore deposits are in the metamorphosed zones of the sedimentary rocks near intrusive igneous masses. No economic mineral deposits have been found in the igneous rocks (figs. 2 and 3).

The lead-silver ore is found mainly in the lower Carboniferous limestone (Madison) either at the contact with the igneous rocks or in fractures in the limestone some distance from igneous rocks. The pattern of the ore shoots, or the course of their localization, is subject to conjecture, owing to both lack of exploration records from former operations and the present inaccessibility of the mine workings.

Deposits so far found in the Belt shales contain copper, gold, and silver; they have been small and generally unprofitable to mine.

The iron-ore deposits are contact replacements in limestone. No large tonnage of good-quality iron ore has been developed in any of these deposits.

Manganese ore occurs in lenses along bedding-plane faults in dolomitic limestone near the western edge of the Castle Mountain granite mass. Near Blackhawk, manganese oxide is associated with lead-silver ore.

### Cumberland (Pb-Ag)

The Cumberland was the largest mine in the Castle Mountain district; in 1891, it was the largest producer of lead ore in Montana. It is on the southeast slope of the Castle Mountains about 1 mile north of the town of Castle (fig. 1). The property, which includes the following claims, is owned by Russell and Clara Manger of White Sulphur Springs, Mont.

| Claim | Survey No. |
|---|---|
| Cumberland | 2865 |
| Merrimac No. 1 | 3491 |
| Stonewall Jackson | 2867A |
| Stonewall Jackson millsite | 2867B |
| Monument | 2864A |
| Monument millsite | 2864B |

Ore was discovered in 1884 by J. E. Hensley and his two brothers; they located the Cumberland claim in 1886. A lease and bond were given to John Ash and Tom R. King, who organized the White Sulphur Springs Syndicate in 1887 to operate the Cumberland mine. Most of the stockholders of the syndicate were White Sulphur Springs business men. The first shipment of lead-silver ore was made in May 1888. This ore was hauled by ox and mule teams 75 miles to Livingston, Mont., from whence it was shipped by railroad to the Chicago & Aurora Smelting Co. at Chicago, Ill. The smelter settlement for this ore, as reported by the "Castle News" of May 3, 1888, was as follows:

| | |
|---|---|
| Weight of ore | 20,742 pounds |
| Silver | 285.72 ounces (27.4 oz. a ton) |
| Lead | 11,331 pounds (60.7 percent) |
| Price of silver | $0.91875 an ounce |
| Price of lead | $0.04 a pound |

Two smelters were erected to smelt the Cumberland ore as well as ore from other mines in the Castle Mountain district. The first bullion was poured on August 17, 1888, according to the local newspaper. Smelting ceased early in 1892 because of the great expense of transporting supplies and bullion. Control of the mine was purchased in 1892 by J. Kennedy Tod of New York City, who spent considerable money in developing and exploring it. It was generally understood at the time that a railroad connecting with one of the transcontinental lines was to be built into the district, but the drop in the price of silver, together with the impending financial panic, caused the plans to be abandoned. In 1893, mining ceased. No mine maps or records of early operations are available. Ore that had been mined and placed on the dump was sold in 1896 to R. A. Harlow, who was constructing the Montana Railroad eastward from Toston, Mont.; the proposed route was down the south fork of the Musselshell River. The main line of the railroad was built as far as Loweth; from there a temporary branch was built northward to within a short distance of the Cumberland mine for the purpose of shipping the ore in the mine dump to the smelter at East Helena, Mont. The temporary railroad branch was dismantled a short time later, and the main line was extended eastward from Loweth to Harlowton.

In 1943, lessees sank a shaft on the outcrop of the vein and removed some ore above the old workings. When the shaft reached the old stope, the loose formation caved, causing the work to be abandoned. In 1945, after an unsuccessful attempt was made to unwater the shaft, an adit was driven from the level of the smelter dump to intersect the old stope in hope of finding ore in the stope fill. When the old stope was reached, the hanging wall caved and blocked the adit. A Reconstruction Finance Corporation loan to unwater the old vertical 290-foot shaft then was obtained, but when the old stope on the 500-foot level off the inclined shaft was found to be caved, the lessees became discouraged and abandoned the lease. The mine was flooded and inaccessible when visited in the summer of 1948. During the fall of 1948, a 682-foot hole was diamond-drilled from a point on the slag dump near the adit portal by a group of mining men from Spokane, Wash. Results of the drilling were not made available. It is understood that further exploring will be done in the spring of 1949.

The Cumberland mine was the largest producer in the Castle Mountain district, but no complete record is available that gives the total amount of ore mined or the quantity of lead and silver recovered.

Weed (13) states that during the years 1890 to 1892 the Cumberland mine produced 5,800,000 pounds of lead. He reported the production of silver for 1890 only to have been more than 20,000 ounces.

MacKnight (5) states that 13,000 tons of ore was smelted in the Cumberland smelter from May 1891 to March 1892. This ore yielded argentiferous lead bullion that was sold for $494,906.44. He stated further that $150,000 worth of lead-silver ore had been shipped to eastern smelters in 1888 before operations began at the local smelter.

Mineral Resources (15) gives the lead production of Meagher County for 1889 as 2,120,000 pounds and for 1892 as 3,279,811 pounds. About 1896, R. A. Harlow shipped 8,486 tons of ore from the Cumberland dumps that contained 5,952,776 pounds of lead and 133,542 ounces of silver. In 1924, James Perry shipped 892.8 tons of Cumberland smelter slag to the East Helena smelter. The average metal content per ton of this slag was 0.47 ounce silver, 5.9 percent lead, and 2.6 percent zinc. Lessees shipped 178 tons of ore in 1943 and 1944 from dumps and shallow workings. The reported metal content was 94,900 pounds of lead and 1,845 ounces of silver.

An estimate based upon all available information indicates that the total production from the Cumberland mine has been about 18 or 20 million pounds of lead and about 615,000 ounces of silver.

Weed (13) described the ore body as an elliptical or pod-shaped mass dipping about 60°, its greatest width roughly conforming to the bedding of the limestone in which it occurred. Ed Sayre, a stockholder in the White Sulphur Springs Syndicate, described the ore body as being in the shape of a crescent, or quarter moon, which was 7 feet wide where discovered on the surface and 75 feet wide on the 500-foot level.

An inclined shaft was started at the outcrop and was sunk about 500 feet. A second shaft, at the bottom of the hill near Castle Creek, was sunk vertically for 290 feet, and a crosscut was driven to connect with the 500-foot level of the inclined shaft. Winzes followed the ore a short distance below the 500-foot level of the inclined shaft, where, according to Weed (13), the ore passed into a narrow pyritiferous zone along the contact of a quartz porphyry dike and limestone. A crosscut driven westward on the 500-foot level cut two quartz porphyry dikes before reaching the main granite mass. The limestone-granite contact dips about 65° east. The sedimentary rocks are said to be more altered in the underground workings than they are at the surface.

The ore consisted principally of argentiferous galena and cerussite with minor amounts of iron pyrite in a gangue of jasper. Available records of former operations indicate that the metal content of the ore ranged from about 20 to 60 percent lead and from 12 to 27 ounces silver per ton. Some gold was recovered from the early shallow workings, but that in the lower workings apparently was unimportant.

## Broadway (Pb-Ag)

The Broadway claim (patent survey 4699) joins the Cumberland claim on the north. It is owned by J. F. Brophy, of Red Lodge, Mont.

The old mine workings consist of several pits and shallow shafts near the south end of the claim. These workings are now caved. A number of bulldozer trenches were excavated in the vicinity of the old workings by lessees during the fall of 1948.

The recent trenches disclosed a mineralized zone striking N. 10°-15° E. in limestone. The zone, which extends southward into the Cumberland claim, is about 50 feet east of the limestone-granite contact.

The dump of one old shaft contains considerable iron pyrite. Pieces of jasper containing cerussite were found scattered through the dump material at some of the old workings. Fine-grained galena in a narrow band of jasper was noted in one of the bulldozer trenches.

## Jumbo (Pb, Ag)

The Jumbo mine is about a quarter of a mile northeast of the Cumberland mine. The property includes the eight patented mining claims listed below:

| Claim | Survey No. |
|---|---|
| Jumbo | 3265 |
| Ontario | 3266 |
| Mint | 3267 |
| Jefferson Davis | 3268 |
| Jumbo Fraction | 3269 |
| Bone of Contention | 3270 |
| Len Lewis | 3324 |
| Severence | 3325 |

The group of claims is owned by the Jumbo Mining Co., of which J. F. Brophy, of Red Lodge, Mont., is principal owner.

The ore deposit was discovered in 1886 or 1887. According to local reports, it was mined by a lessee in 1898; the amount of ore produced is not known.

The geology at the Jumbo mine is similar to that at the nearby Cumberland mine. The formation exposed at the surface is largely Madison limestone. Only one small outcrop of quartz porphyry was noted. Disintegrated porphyritic material and limestone in the dumps at some old caved workings indicate that the ore body may be in limestone at or near the contact with quartz porphyry. The limestone in the vicinity of the mine strikes north and dips from 45° to 70° E. Patent notes on the Jumbo claim on file in the Land Office at Helena, Mont., mention the strike of the vein as N. 12° E. with a dip of 80° E. Some of the limestone is intensely brecciated. Weed (13) states that this brecciation was caused by the sharp folding of the Madison limestone.

Numerous pieces of lead carbonate in brown jasper are present in the shaft dumps and in dumps at old pits. The position of the shafts and pits where ore was found indicates a vein or series of veins about 500 feet long striking north.

### Yellowstone (Pb-Ag)

The Yellowstone mine is on the ridge between Hensley Creek and Hamilton Creek, about 1 mile west of the old town of Robinson. The property, consisting of one mining claim and a millsite, is owned by the Yellowstone Mining & Smelting Co. This organization is controlled by C. B. Power of Helena, Mont.

The ore body was discovered in 1886 and was mined for about 5 years. The first smelter erected in the district was known as the Yellowstone smelter. It was situated about 1 mile southwest of the town of Castle. After operating a short time, it was dismantled and moved to the Cumberland mine. The Yellowstone mine was closed about 1893. Since that time, the property has been leased by several operators, who have shipped considerable ore from dumps and shallow workings. In 1926 and 1927, a lessee shipped about 3,800 tons of slag from the Yellowstone smelter dump. Forty-eight tons of ore was shipped from the property in 1946; the smelter returns from this shipment are reported to have been as follows: 1.0 ounce gold, 193 ounces silver, 15,000 pounds lead, and 1,500 pounds zinc. During the fall of 1948, lessees from Livingston, Mont., diamond-drilled one hole at the mine; results of the drilling are not available.

Statistics, which probably are incomplete, give the production of the Yellowstone mine as 1,500 tons (5). The metal content is not known.

The exposed formation at the mine is quartz porphyry, which is part of an intrusive sheet (13). The mine dump contains limestone, indicating that the ore body is at or near a limestone-igneous contact.

Specimens of ore found on the mine dump contain galena and cerussite in brown jasper. The lead content of the specimens ranges from about 10 to 60 percent.

The shaft is 400 feet deep (1). Underground development includes 500 feet of drifts and crosscuts on four levels. J. E. Hensley, one of the former owners of the mine, stated that a 3-foot vein of galena ore was exposed on the 400-foot level when the mine was closed. When visited in the summer of 1948, the shaft was caved at the collar; the workings were inaccessible.

### Great Eastern and Great Western (Pb-Ag)

The Great Eastern-Great Western group is on the point of the ridge between Hamilton Creek and Hensley Creek, about one-quarter of a mile southeast of the Yellowstone mine. The group, consisting of the following patented claims, is owned by J. F. Brophy.

| Claim | Survey No. |
|---|---|
| Great Eastern | 3277 |
| Great Western | 2605 |
| Bamboo Chief | 3275 |
| Elkhorn | 3276 |

Little information on the history of the mine is available. One report states that 500 tons of ore was produced from the Great Eastern mine, which was opened by a 300-foot shaft (5). The patent notes in the Land Office at Helena, Mont., show that 825 feet of drifts and crosscuts had been driven at the time the Great Eastern claim was patented in 1890. According to a local report, a plan was proposed to drive a 700-foot adit from a point on the Great Western claim near Hamilton Creek to intersect the Great Eastern shaft 380 feet below the shaft collar.

The ore body occurs along a northwest-trending contact of quartz porphyry and brecciated limestone (13). Lead carbonate ore found on the mine dump shows characteristics similar to those of ore found at other mines in the district.

The shaft is caved, and all the workings are inaccessible.

### Homestake (Pb-Ag)

The Homestake group, comprising the following eight patented mining claims on the ridge between Hamilton Creek and Hensley Creek, is owned by J. F. Brophy.

| Claim | Survey No. |
|---|---|
| Homestake | 3220 |
| Mary Anderson | 3361 |
| Mills Bill | 3222 |
| Blue Bird | 3215 |
| Hamden | 3216 |
| Hamden No. 2 | 3217 |
| Corliss | 3218 |
| Hillside | 3221 |

Considerable prospecting has been done along the many irregular contacts of Carboniferous limestone and quartz porphyry, but no ore bodies of indicated economic importance have been discovered. A small shipment of lead-silver ore was made in 1925. The mine workings consist of several pits or shallow shafts and one short adit, all of which are caved.

## Hidden Treasure (Pb-Ag)

The Hidden Treasure claim is near the top of the ridge between Hensley and Robinson Creeks. The mine is just north of the Castle-Robinson road. Leuthold & Sawyer, represented by W. M. Leuthold, Deer Park, Wash., hold a two-thirds interest in the claims; Amelia Mayn, represented by Harold Mayn, White Sulphur Springs, Mont., holds a one-third interest.

The mine was operated from about 1888 to 1893. Production figures are not available. The "Castle News" of May 17, 1888, published the following news item:

> Dunn and Donovan received returns on a sample of ore from the Hidden Treasure sent to Omaha. It went 70 ounces in silver, $8 in gold, and 59 percent lead.

The mine dump is composed of Belt shale and quartz porphyry; limestone is exposed nearby. The relationship of the ore body to these rock formations is not disclosed.

The ore consists of galena and its oxidized products in jaspar. The mine dump contains considerable manganese oxide.

The shaft is reported to be 200 feet deep. The lengths of the drifts and crosscuts are not known. The collar of the shaft is caved, and all workings are inaccessible.

## Solid Silver (Pb-Ag)

The Solid Silver claim (patent survey No. 3219) is on the slope east of Hensley Creek, about half a mile west of Robinson. It is owned by Russell Manger, of White Sulphur Springs. No information on its history and production is available.

The deposit is a replacement in limestone near a quartz porphyry contact. It ranges in width from 2 to 3 feet, strikes N. 58 W., and dips nearly vertical. Development was by two shafts that now are caved and inaccessible.

Specimens of ore on the dump contain cerussite and galena in brown jasper. The lead content in these specimens ranges up to 50 percent.

## Silver Spoon (Pb-Ag)

The Silver Spoon mine, owned by J. F. Brophy, is on the east side of Robinson Creek, about half a mile below the old town of Robinson. The property consists of one unpatented claim. The vein was discovered about 1887.

The "Castle News" of April 12, 1888, gave an optimistic account of the vein, which had been discovered only recently. At that time the claim was known as the Powderly. No record of ore production is available.

The vein occupies a fracture in limestone; it is 2 to 3 feet wide, strikes N. 59° W., and dips 77° SW. The limestone strikes N. 45° E. and dips 58° SE. No igneous rocks were observed nearby. Specimens of ore in the dump contain large cubes of galena in brown jasper. Many of the specimens contain 20 to 50 percent lead.

The mine was developed by an adit that cut the vein about 50 feet below its outcrop. The length of the vein, as indicated by trenches and holes through to the surface from underground workings, is about 200 feet. The portal of the adit is caved; the underground workings are not accessible. A strong draft from the caved portal, however, indicates that the workings are open behind the cave.

## Silver Star (Pb-Ag)

The Silver Star claim, survey No. 3131, is on the slope west of Robinson Creek, about half a mile south of the old town of Robinson. The claim is owned by the Grande Ranch Co., Lennep, Mont.

No information on the history or production of the mine is available. The dump of the old caved shaft indicates that the underground workings are not extensive.

The vein occupies a fracture in limestone; it strikes N. 45° W. and dips 80° SW. The limestone strikes S. 70° W. and dips 45° to 60° SE. A decomposed porphyritic dike is exposed about 25 feet south of the old workings.

Several pieces of ore containing both cerussite and galena were found on the shaft dump.

## Iron Chief (Pb, Ag, Fe)

The Iron Chief mine is on the slope west of Robinson Creek, about half a mile north of the old town of Robinson. The claim is owned by the George Wilson estate, which is administrated by Nellie W. Wilson, Roundup, Mont.

According to the local newspaper, the Iron Chief shaft was started in May 1888. The Montana Mine Inspector's report for 1890 gave the depth of the shaft as 270 feet and stated that levels were driven at 100 and 200 feet.

No record of the lead-silver production is available, but it is reported locally that iron ore was mined from an open-cut and used as flux at the Cumberland smelter.

The mine is in an area of Belt shales, quartz porphyry sills, and limestone. The contacts between these various rocks are irregular and are covered by a thick mantle of overburden. One outcrop of hard, fine-grained magnetite is conspicuous. It is about 60 feet long, 25 feet wide, and stands 15 feet above the ground surface. This outcrop is on the east edge of a mineralized zone about 100 feet wide, which can be traced by its red iron-stained float for about 1,000 feet southward into the California and Hendricks claims.

The Iron Chief shaft is on the west edge of this zone about 130 feet southwest of the magnetite outcrop. Iron pyrite is conspicuous on the dump of the caved shaft, but no lead ore was observed. It was reported (13) that ore from a vein worked through the shaft yielded 50 percent lead and 20 to 30 ounces silver per ton. The shaft is caved and inaccessible.

California and Hendricks (Pb, Ag, Fe, Mn)

These two patented claims are on the west side of the old townsite of Robinson; they adjoin the Iron Chief claim at the south. The property is owned by Mrs. C. P. Tooley, of Harlowton, Mont.

The wide mineralized zone on the Iron Chief claim continue southward into the California and Hendricks claims. Many old pits and trenches have been excavated at irregular intervals across the zone. The dumps of many of the pits contain brown jasper, but no lead minerals were observed. It was reported locally that iron ore from the property was used as flux at the Cumberland smelter, but no outcrop of magnetite iron ore was observed. According to information obtained locally, the main shaft was 140 feet deep; it is contended that a crosscut on the 75-foot level penetrated 115 feet of iron ore before reaching the lead deposit. Examination of the dump at this shaft revealed no magnetite or lead minerals. According to Weed (13), the California mine was not developed sufficiently to show the extent of the ore body when he visited it in 1894. All of the workings were caved and inaccessible in 1948.

Blackhawk and Alice (Pb, Ag, Mn)

The Blackhawk-Alice group lies south of a diorite intrusive mass near the old town of Blackhawk. The group is owned by Russell Manger of White Sulphur Springs, Mont., and J. F. Brophy, of Red Lodge, Mont.; it consists of the following five patented claims:

| Claim | Survey No. |
|---|---|
| Blackhawk................. | 1932 |
| Bondholder............... | 1930 |
| Alice..................... | 2877 |
| Altha..................... | 2749 |
| Annie Maud............... | 2424 |

Little information about early operations is available. Production probably was small in comparison to some of the larger mines in the southern part of the district.

The ore body is said to occur along the contact of quartz porphyry and limestone (13). The shaft was started on the outcrop of a 4-foot vein that struck west and dipped about 50° to 60° S. The vein exposed at the collar of the caved shaft is composed mainly of jasper, iron oxide, and manganese oxide. The vein near the surface just west of the shaft has slumped and formed a blanket deposit, 1 to 2 feet thick, composed of fragments of jasper cemented with iron and manganese oxides. Crystals of galena were noted in some of the jasper where the blanket vein is exposed in an old trench. Representative samples of the material in the 4-foot vein at the collar of the caved shaft and of the material in the blanket vein exposed in the old trench assayed as follows:

|  | Ounce per ton |
|---|---|
| Gold.................... | 0.01 |
| Silver.................. | 1.00 |
|  | Percent |
| Lead.................... | 3.2 |
| Manganese............... | 9.0 |
| Iron.................... | 32.6 |

The workings on the Blackhawk claim are reported to consist of a 130-foot shaft with 200 feet of drifts along the vein and a 100-foot crosscut on the 100-foot level (13). The report further states that water prevented deeper work. The Alice shaft is 85 feet deep. According to local reports, the vein was considered to be continuous between the Blackhawk and Alice claims for about 1,000 feet.

### Judge (Pb-Ag)

The Judge mine is on the top of a flat ridge about one-fourth mile northeast of the old town of Blackhawk; it is owned by J. F. Brophy. The mine was operated in 1894 (13) after many of the mines in the district had closed. In his report for 1897, the Inspector of Mines for Montana states that the Judge shaft was 230 feet deep and that the ore was being shipped to the smelter at East Helena, Mont. No work has been done in recent years.

The vein is in metamorphosed Cambrian limestone. The ore shoot is reported to range from 8 inches to 4 feet in width and to be about 20 feet long (13). Ore found in the dump consists of jasper containing galena and cerussite.

The workings, consisting of a two-compartment shaft 230 feet deep and 40 or 50 feet of drifts and crosscuts, are inaccessible.

### Queen-Hensley (Fe-Cu)

The Queen-Hensley group, consisting of the Queen, Erma, Preston, Morning Star, and Hensley claims, was located originally by J. E. Hensley and Harold Hensley; it is now held by location by Mrs. T. H. Hurrah, Kellogg, Idaho. The claims are on the east side of Hensley Creek about 1 mile northwest of the old town of Robinson.

Production from the Queen claim is reported to have been about 2,000 tons of iron ore (3). This ore was sold in 1902 to the American Smelting & Refining Co. at East Helena, Mont., for use as flux. Analyses made by the smelting company of five samples of the ore are reported as follows:

Digitized by Google Original from THE OHIO STATE UNIVERSITY

| Percent | | | | | | | Oz. per ton |
|---|---|---|---|---|---|---|---|
| Fe | Insol. | $SiO_2$ | Mn | S | Cu | Pb | Ag |
| 61.5 | 8.9 | - | 1.0 | Trace | - | - | - |
| 53.9 | 11.9 | - | 0.7 | 0.2 | - | - | - |
| 53.4 | - | 10.0 | - | - | 2.3 | Trace | 1.0 |
| 56.8 | - | 6.4 | - | - | 0.6 | 0.8 | 0.3 |
| 55.0 | - | 11.6 | - | - | 1.0 | 1.0 | 0.8 |

The ore deposits occur as replacements of sedimentary rocks (Belt shale series) at the contact with sills of quartz porphyry. Iron ore is exposed along the surface in a series of echelon lenses for a distance of about 500 feet. The lenses range to 6 feet in thickness. The general strike is about N. 15 W.; the dip is about 20 NE. According to J. E. Hensley (3), adits on the Queen claim penetrated iron ore 50 to 100 feet. The workings are caved and inaccessible.

The ore is fine-grained magnetite with a small amount of chalcopyrite, iron pyrite, and occasional copper carbonates and silicates.

### Top Lode-Copper Top (Cu)

The unpatented Top Lode claim has been known in past years as the Copper Top or Tip-Top. The claim is now held by location by Russell Manger.

A small amount of copper ore was shipped in 1916-17 from the Copper Top claim. Little additional information about its history or production is available.

According to Weed (13), the deposit is at the contact of densely baked shale (Belt series) and a decomposed minette dike. The shaft was 100 feet deep at the time of his visit.

Ore in the dump of the caved shaft contains chalcopyrite and oxidized copper minerals. Two samples of the ore in the dump, taken by W. A. Noon, are reported to have assayed as follows:

| Oz. per ton | Percent | |
|---|---|---|
| Au | Pb | Cu |
| 0.035 | 0.24 | 1.90 |
| .02 | .16 | 1.54 |

### Belle of the Castles (Cu)

The Belle of the Castles claim is on the steep slope west of Hensley Creek about 1 mile northwest of Robinson. The property, consisting of one patented claim is owned principally by Mrs. T. H. Hurrah.

The mine workings, consisting of two adits and a shaft, are caved and inaccessible. The material in the dumps and the overburden near the workings is mainly quartz porphyry and Belt shale.

Quartz vein material on the shaft dump contains chalcopyrite and is similar in character to ore from other copper deposits occurring in the Belt shales.

Little information on the history and production of the mine is available. It was reported locally that small amounts of copper ore have been shipped in recent years.

### Willow Creek-Ringling (Fe)

The Willow Creek iron property, consisting of the Consolidated Ringling claim, is just east of Willow Creek, about 5 miles southeast of White Sulphur Springs. The property is owned by the R. T. Ringling Estate, White Sulphur Springs, Mont.

The deposit was discovered shortly before 1920. In the spring of that year the property was purchased by R. T. Ringling, who negotiated and completed a contract with the American Smelting & Refining Co. at East Helena, Mont., for 5,000 tons of the iron ore for use as flux. No further production was made.

The ore occurs in a contact replacement between crystalline limestone and coarse-grained granite. The contact is irregular, but the deposit appears to strike about northeast and to have a vertical dip. The open stope from which ore was mined indicates that the ore body was about 120 feet long, 25 feet wide, and about 50 feet deep.

The ore ranges from dense, hard, fine-grained magnetite to a limestone only partly replaced by magnetite. Soft hematite is present in places. No iron pyrite was observed, but some pieces of ore contained cavities that probably are pyrite casts. Three samples of the ore taken in 1944 by the Bureau of Mines assayed as follows:

| | Analyses, percent | | |
|---|---|---|---|
| | Fe | S | $SiO_2$ |
| Low-grade ore left in stope............... | 50.30 | 0.038 | 18.98 |
| Sorted ore, upper adit dump............... | 64.35 | .070 | 3.06 |
| Ore from bin at portal of lower adit...... | 52.62 | .046 | 1.02 |

The ore was mined from a "glory hole", or stope open to surface, and trammed through an adit 50 feet below the outcrop of the ore body. A second adit was driven 100 feet below the first, but little or no ore was mined from it. Both adits are inaccessible now because of caves near the portals.

### Alabama-Cleveland (Mn, Ag)

The Alabama-Cleveland manganese mine is near the base of the west slope of the Castle Mountains, 5 miles southeast of White Sulphur Springs. The property, consisting of two unpatented mining claims, is owned by Russell Manger.

The claims were located about 1888 as a result of the discovery of silver ore. It is reported that a few tons of manganese ore was shipped from the Cleveland mine in 1917 (6). E. B. Hubbard, of Helena, organized the Castle Mountain Co. in 1925 to explore the property for lead and silver. An adit was driven, but no record of ore production is available. Ira L. Judkins later obtained a lease on the property and in 1944 obtained a contract from the Metals Reserve Co. for 500 tons of manganese ore. No records on how much of this tonnage may have been mined and shipped are available. The property is idle.

The mine workings consist of two adits - one, 170 feet long, on the Alabama claim and the other, 200 feet long, on the Cleveland claim. The Cleveland adit is caved and inaccessible. The Alabama adit is open and in fair condition.

Limestone and shale striking northwest and dipping 45° SW. are exposed in the vicinity of the mine workings. The rocks probably are members of the Belt series. Manganese ore occurs in lenses along bedding-plane faults in the limestone (6). Three lenses of ore are exposed in the Alabama adit. Two are about 20 feet long and 3 feet thick; the third is 80 feet long and 4 feet thick. Only narrow stringers of ore were present in the Cleveland adit.

Most of the ore consists of pyrolusite and wad and contains 11 to 23 percent manganese. A few inches to as much as 3 feet of hard, nodular psilomelane containing 35 to 40 percent manganese usually occurs near the footwall of the lenses. The psilomelane can be hand-sorted to make a shipping product; however, the pyrolusite is so soft and intimately mixed with gouge and clay that it is impossible to improve the grade materially by hand sorting.

### Other Properties

In addition to the properties heretofore described, numerous claims have been located in the Castle Mountain district. During the heyday of the district, claims were located along almost every known crystalline limestone-igneous rock contact as well as along contacts of Belt shales with igneous rocks. The workings at most of these properties now are caved and inaccessible. Little is known of their history and development. Among these claims are the Skidoo, Grasshopper, Vandar, Mohawk, Baltimore, Merrimac, and Snowdrift.

## Murray (Battle Creek) District

A number of mining claims have been located near the headwaters of Battle Creek, about 14 miles south and 4 miles west of White Sulphur Springs. The district is at an altitude of about 5,600 feet in a terrain of gently rolling, grass-covered hills. The geologic formations exposed in the vicinity of the mines are Belt shales.

### Steward and Battle Creek (Cu)

These claims, which are about 1 mile north of Battle Creek, are owned by George Fowlie, et al, Whitehall, Mont. The property produced a few cars of copper ore in 1918, the copper content of which was not reported.

The quartz-calcite vein 3 to 4 feet wide occupies a steeply dipping fracture striking N. 66° W. in thin-bedded, flat-lying Belt shale. The ore minerals, as shown by vein material on the dump of the 100-foot caved shaft, are chalcopyrite, chalcocite, azurite, and malachite. The workings now are caved and inaccessible.

### Other Properties

Among other properties in the Murray district are the Copper Glance and Copper Queen. Little information as to these properties is available, except that some copper ore was shipped from the Copper Queen in 1923 and from the Copper Glance in 1929 and 1930.

## Musselshell District

The Musselshell district, as considered in this report, embraces the region drained by the North Fork of the Musselshell River, with the exception that its extent south of the river is limited to the foothills north and east of the Castle Mountains.

The mines and prospects are at altitudes ranging from 5,500 to 6,500 feet. They are accessible by mountain roads and trails leading from Montana Route 6, a highway that follows the valley of the North Fork of the Musselshell River.

Copper ore was first discovered in the district about 1867 (11). It was developed and operated as the Copperopolis mine. Prospecting has been general throughout the district, but no large mines have been developed. Mining was at its peak from 1914 to 1924; however, production records are not available. Only 3 tons of ore has been reported produced in the Musselshell district since 1932.

The principal rock formation in the district is the pre-Cambrian Belt series (fig. 2). Sedimentary rocks ranging from Cambrian through Jurassic border the district on the south, east, and north. Igneous activity is represented by numerous dikes and sills of porphyritic rock and by a basaltic flow. The metallic mineral deposits so far found generally occur as narrow quartz-calcite veins along fractures and bedding planes, chiefly in shales and slates of the Belt series.

### Copperopolis (Cu, Ag)

The Copperopolis mine is 18 miles east of White Sulphur Springs in the low foothills south of the North Fork of the Musselshell River. The property, consisting of 21 patented claims, is owned by the Daily Realty Co., represented by C. A. Crawford, of Hamilton, Mont. The main workings are on the Northern Pacific, St. John, and Darling Fraction claims.

Copper ore was discovered in 1867, at which time a small shipment was sent to Swansea, Wales (11). The mine was most active during 1914-1924. No production records are available.

The ore occurs in narrow veins that cut calcareous Belt shales. The veins show evidence of much faulting. The ore minerals are chalcopyrite with chalcocite, copper oxides, silicates, and carbonates.

The Montana Mine Inspector's report for 1900 states that the Northern Pacific shaft was 500 feet deep and the St. John shaft was 200 feet deep. The amount of drifting and crosscutting is not known. It was reported locally that the ore terminated 15 feet below the 400-foot level of the Northern Pacific shaft. Shafts are caved, and workings are inaccessible.

## Jumbo (Lucky Boy) and New Deal (Boss) (Cu)

The Lucky Boy and Boss claims were relocated in 1938 by the Tarbosky brothers of Harlowtown, Mont., and now are known as the Jumbo and New Deal. The claims are about 5 miles northwest of Findon (fig. 1).

Some copper ore is reported to have been mined from the Lucky Boy claim in 1915 and 1927, but details concerning that production are not available. The Tarbosky brothers reported that they shipped one car of ore containing about 13 percent copper in 1943. The ore was stoped from above the 50-foot level of the Jumbo mine.

The Jumbo and New Deal claims are in an area of Belt shales with nearby dikes or sills of syenite porphyry. A quartz vein said to be 1 to 7 feet wide occupies a fracture that strikes N. 65° to 75° W. and dips 70° to 90° NE. in the thinly bedded shales. The same fracture system probably is present in both claims. The vein near the collar of the former Boss shaft is about 6 inches wide. The ore minerals are chalcopyrite with bornite and possibly some covellite.

The shaft on the present Jumbo claim, as reported by one of the claim owners, is 110 feet deep, with levels at 50 and 100 feet. The shaft on the present New Deal claim is 140 feet deep, with a level at 100 feet. The shaft workings are flooded with water to within 10 feet of the surface.

## Clara Burton (Cu)

The Clara Burton mine is about 5 miles west of Findon (Fig. 1). Ore was discovered about 1880, when the Claraton claim was located. It is reported that 60 or 70 tons was shipped in 1896. The claim was purchased from the original locator by William Sutherland in 1900 and later was relocated as the Clara Barton. Some 18 percent copper ore is reported to have been mined in 1908 and 1909. Mining ceased in 1928, when M. B. Staley mined a small amount of ore. The tonnage of ore produced during the various periods of operation is not known, but apparently was small.

The vein, containing chalcopyrite and some secondary copper minerals in a quartz and calcite gangue, occupies a steeply dipping fractures that strikes northeast in Belt shales. No igneous rocks were observed in the vicinity of the mine workings.

The shaft is reported to be 300 feet deep, with levels at 50, 100, and 200 feet. The extent of the underground workings is not known. The shaft and mine workings now are caved and inaccessible.

## Montana Copper (Barnette) (Cu)

The Montana Copper mine is 4 miles south of Delpine. The property, consisting of three unpatented claims, is owned by George E. Knight and Fred Knopper of White Sulphur Springs, Mont. The property was owned and operated originally by Dr. Barnette, of White Sulphur Springs, who is said to have shipped 31 tons of ore containing 15.34 percent copper about 1918.

The vein in Belt shales strikes N. 50° to 60° W. and dips about 60° SW; it is 2 to 18 inches wide. A dike or sheet of quartz porphyry crops out about 700 feet east of the mine workings. The ore minerals are chalcopyrite with some carbonates and silicates.

The mine workings consist of an upper and a lower adit 185 and 125 feet long, respectively. From the upper adit a stope 35 feet long was opened to the surface, and a winze was sunk 18 feet on the vein. The face of the lower adit, which is 37 feet below the upper adit, would have to be advanced about 50 feet before it would reach the winze when deepened.

The Montana Copper mine was the only one in Meagher County that produced ore in the fall of 1948, when George E. Knight and his father mined a small amount in deepening the winze.

## Other Properties

Small shipments of ore from other properties in the Musselshell district have been reported from time to time in the Geological Survey Mineral Resources of the United States and the Bureau of Mines Mineral Yearbooks. Little other information on those properties is available. Many of the claims from which some ore was mined have been abandoned for many years; some were relocated later under different names.

The Biesel, Calumet-Jamison and Hecla, and Copper Duke (Virginia) claims in the vicinity of the Copperopolis mine have produced copper ore from veins in the Belt shales. Other claims elsewhere in the district from which some ore has been mined are the Badger, Blue-eyed Nellie, Bullion, Capitol Hill, Copper Hill, Crown Point, Morning Star, Musselshell, Park, and Surprise.

## Tenderfoot-Sheep Creek District

The Tenderfoot-Sheep Creek district, as considered in this report, embraces the region on the western slope of the Little Belt Mountains that is drained by the Smith River (Fig. 1).

The geologic formations in the district are chiefly of sedimentary rocks consisting of shales, slates, sandstones, and limestones that range in age from Cretaceous through pre-Cambrian (fig. 2). These sedimentary formations are intruded by numerous small igneous dikes and sills. Archean gneiss and schist are exposed in the north-central part of the district.

Available statistics show that only 2 tons of ore has been shipped from the district during the past 16 years.

Copper State (Zn, Pb)

The Copper State mine is 15 miles northeast of White Sulphur Springs on the slope east of Guise Creek, a southward-flowing tributary of the North Fork of the Smith River.

The property, consisting of the Duke, Mammoth, Byron, and Mary Rose patented claims, is owned by the Montana Copper & Zinc Co., which is represented by C. E. Pew, 314 Fuller Ave., Helena, Mont. The company conducted operations sporadically from 1920 to 1927. Two small shipments of sorted zinc ore were made to a custom mill in Salt Lake City, Utah.

The mine workings consist of four shafts. The main shaft on the Duke claim is reported to be 200 feet deep and to have a 40-foot drift at the bottom. The other shafts are shallow. All of the workings are either caved or filled with water.

The vein, consisting mainly of quartz and calcite, occupies a steeply dipping fissure in thin-bedded Belt shales. It can be traced by float and by old prospect pits for about 2,000 feet in a generally easterly direction from the main shaft. The vein is reported to be 2 to 14 feet wide where exposed in the underground workings. The width ranges from 1 to 12 feet where exposed in old trenches along the strike.

The ore in the bin and on the dump at the Duke shaft consists chiefly of dark sphalerite, or possibly marmatite, with some galena and a little chalcopyrite. Oxidized copper minerals were observed in a trench about 500 feet east of the shaft. Some galena is present in the dump of one of the pits at the eastern end of the vein. A Bureau of Mines sample taken from about 10 tons of sorted ore in a bin assayed 0.01 ounce gold, 0.33 ounce silver, 31.0 percent zinc, 5.9 percent lead, and 0.8 percent copper. The dump at the Duke shaft contains about 150 tons of material. A sample of this dump assayed a trace of gold, 0.2 ounce silver, 6.85 percent zinc, 0.9 percent lead, and 0.3 percent copper.

Ducolon-Potter (Pb, Ag)

The Ducolon-Potter claims are 28 miles north and 13 miles west of White Sulphur Springs on the slope south of Tenderfoot Creek, a westward-flowing tributary of the Smith River. The two mining claims are held by location by W. E. Ducolon and John V. Potter, of White Sulphur Springs.

The original claims were located about 1895; they were relocated recently by the present owners. According to W. E. Ducolon, work was done on the property at various times from 1895 to 1903. Eight tons of lead ore was hauled in wagons to the smelter at East Helena, Mont.

A small steeply dipping quartz vein 18 to 20 inches wide strikes east in thin-bedded limestone. The limestone strikes east and dips about 15° S.

No igneous rocks were observed in the vicinity of the workings. The mine workings consist of three adits, all of which are caved and inaccessible. W. E. Ducolon stated that the lengths of the adits were 25, 40, and 165 feet.

Scattered small amounts of copper carbonates and oxides occur along bedding planes in the limestone. No lead minerals could be found in the dumps of the caved adits.

## Sheep Creek Iron (Fe)

The Sheep Creek iron deposits are 15 miles north of White Sulphur Springs, the nearest railroad point, or 24 miles distant by highway and county road. The deposits were first prospected for precious metals in the 1870's. Claims were located later for iron ore. The iron deposits were prospected by driving two short adits, digging numerous shallow cuts and pits, and by a small amount of churn drilling. The relatively low iron content and the impurities in the iron ores prevented successful exploitation. No shipments of iron ore have been recorded.

The principal known iron-bearing area is covered by 20 lode mining claims, 12 of which are patented. All of these claims are owned or held by E. K. Coyner of Marion, Va. The entire group of claims was held under a lease and purchase option in 1943 and 1944 by the Yellowstone Metals, Inc., 424 Stapleton Building, Billings, Mont.

The Bureau of Mines investigated the deposits in 1943 and 1944 by churn drilling, bulldozer trenching, and sampling. Beneficiation tests were made on the ore (9). Twenty-three holes with a combined length of 1,159 feet were drilled; 13 of these penetrated material containing 20 percent or more iron. Nine crosscut trenches with a combined length of 1,055 feet were excavated. More than 1,000 drill-hole and channel samples were taken, of which 300 were analyzed. Beneficiation tests, consisting of log washing followed by sink-float, jigging, and table concentration, showed that only slight improvement in grade and no reduction in sulfur content could be made by such methods. However, the sulfur content could be reduced materially by sintering. Hydrogen-reduction tests indicated that very little improvement could be achieved in rejecting the high silica content.

The rock formations exposed in the vicinity of the deposits are thin-bedded shales and arenaceous limestones of the Algonkian Belt series. Some of the shales are ferruginous and contain intercalated lenses of jasperoid. The central part of the area investigated is on or near the axis of a flat, westward-trending anticline.

The deposits occur as steeply dipping fissure veins and as replacements extending outward from the fissure veins along favorable bedding planes. The known fissure veins have been exposed over a strike length of 1,300 feet; they range from 12 to 50 feet in width, averaging about 38.4 feet. The bedded deposits range from narrow seams to a maximum thickness of 105 feet, averaging about 16.6 feet. At least five horizons disposed over a stratigraphic interval of 500 feet have been replaced in part by ferruginous material. Erosion has removed a great part of the several bedded ore horizons. In general, the

Sheep Creek iron ores are three distinct types, depending on ratios between hematite, limonite, and silica. The high sulfur content is associated chiefly with the higher-grade material. Sampling by the Bureau of Mines (9) shows the iron content to range upward to a maximum of 59 percent, although the calculated average is 31.7 percent. Available information indicates that these ores average about 29 percent silica, 0.50 percent sulfur, and 0.045 percent phosphorus, although some contain less of these impurities.

No work has been done at the property since the Bureau's investigation.

Iron Mountain (Fe)

The iron deposits at Iron Mountain or Iron Park are near the crest of the Little Belt Mountain Range, about 30 miles north of White Sulphur Springs or about 9 miles west of Neihart. The deposits are in an isolated area. The nearest railroad point is Armington, about 35 miles north by trail, road, and U. S. Highway 89. Ten patented claims are reported to be owned by Dewey F. Whittaker, of Great Falls, Mont. The deposits were first located and prospected for copper by John Mortinson of Monarch, Mont., as some scattered copper carbonates were in evidence, and he considered the iron oxides to be a gossan capping to underlying copper ores.

Several shafts of unknown depth and six or more trenches constitute the work done on the property. This work was done at intervals within a distance of about 1,500 feet at an average altitude of about 7,450 feet. The shafts are caved, and the trenches are filled with debris.

The rock formation in the vicinity of the workings is thin-bedded siltstone or shale (2), which contacts a laccolithic mass of syenite about 300 feet to the north. The shales, or argillites, dip 13° to 15° SW. Because of the lack of ore exposures, the occurrence, size, and extent of the iron-ore deposits could not be determined. However, they apparently are replacements along bedding planes in the argillites.

Most of the area is covered by overburden. No ore could be seen in place. Ore composed of limonite, hematite, and magnetite can be found in the old dumps along some of the trenches, in the dump at one of the shafts, and as float in the overburden. Some specimens showed malachite and azurite along joint cracks. The porous texture of some of the ore indicates the former presence of sulfides (2).

A grab sample of what appeared to be the best of the ore in the dumps along the trench at the southern end of the workings was taken in 1948 by a Bureau of Mines engineer. This sample assayed 58.4 percent iron, 4.3 percent silica, 0.8 percent lime, and 0.04 percent phosphorus. The sulfur content was not reported.

Lynn (High Tariff) (Pb-Ag)

The Lynn mine is 13 miles north and 3-1/2 miles east of White Sulphur Springs; it is owned by Russell Manger.

Little information concerning its history is available. According to a local report, 50 tons of lead ore was mined and shipped. Efforts to find additional ore shoots by sinking and drifting are reported to have been unsuccessful.

The mine workings consist of a shaft 100 feet deep and an adit drift about 100 feet long. The workings are caved and inaccessible.

A bleached, decomposed porphyritic dike is exposed at the surface above the caved workings. The dike, which cuts thin-bedded Belt shale, is about 2 feet thick and strikes N. 30° E.; it can be traced on the surface for about 600 feet. The dike appears to have been bleached and mineralized for a length of only about 20 or 30 feet in the vicinity of the workings. The dumps are composed of shale and white claylike material. Two small piles of sorted ore on the mine dump contain fine-grained galena, pyrite, and arsenopyrite. A sample of this ore assayed 0.01 ounce gold, 28.57 ounces silver, and 8.9 percent lead.

### Gold Placers

In 1934 and 1935, a few ounces of placer gold was washed from the gravel of Placer Creek, a small southward-flowing tributary of Tenderfoot Creek (15) (4). Operations have been intermittent, and the returns have been small.

## Beaver Creek District

The Beaver Creek district embraces the region drained by the tributaries of the Smith River on the eastern slope of the Big Belt Mountains. (fig. 1) The district is accessible from White Sulphur Springs by a graveled county highway along the Smith River Valley, thence by forest roads and trails up the canyons of numerous northeastward-flowing creeks. Altitudes range from 5,000 feet in the Smith River Valley to about 8,000 feet at some of the mountain summits.

The principal rock formations with which the metallic mineral deposits are associated are the pre-Cambrian Belt series. Carboniferous through Cambrian rocks are exposed in the northern part of the district; Neocene lake-bed sediments occur along the Smith River Valley. Dikes, stocks, and sills of granitic rock intrude the sedimentary formations.

The principal metal production has been gold, mainly from placers. One deposit in the northern part of the district has produced a small amount of manganese oxide. Since 1932, 3,096.31 ounces of gold has been produced from the Beaver district, as compared with only 10.02 ounces from all other districts in Meagher County. The total gold production of Meagher County from 1883 to 1947 was 66,599.22 ounces; most of this gold probably came from placers and lode mines in the Beaver district.

Little information on mining is available. It is reported that gold was discovered in the gravel of Thompson Creek in 1865 (4). Many of the placers in this district were discovered about the same time that the rich discoveries were made in Confederate, Avalanche, and White Gulches just across the divide in Broadwater County on the western slope of the Big Belt Mountains.

The lode gold deposits occur as small quartz veins and stringers along cross fractures and small bedding-plane faults, mainly in Belt shales near igneous intrusions. An extensive vein of quartz occurs in granite. In the shallow workings, most of the gold occurs free, associated with quartz, iron oxide, and calcite. The gold veins below the oxidized zone usually contain a little iron pyrite, chalcopyrite, and galena.

## Snowbank (Au)

The Snowbank mine is at the head of Thompson Creek, about 16 miles west of White Sulphur Springs. The property, consisting of 12 unpatented claims, is owned by the Beverly Hills Mining Co., White Sulphur Springs, Russell Manger, president. Past operations at the property have been known under the names of the Porcupine Mining Co. and the Snowbank Mining Co. (12).

Production records for the mine prior to 1932 are not available. Since 1932, production is reported to have been 373 tons of ore that yielded 268.88 ounces gold, 177.0 ounces silver, 1,300 pounds copper, and 4,000 pounds lead.

The mine workings consist of three adits. The upper adit is 200 feet long; it is the only adit that was accessible in the summer of 1948. The other two adits are reported to be 400 and 700 feet long. The vertical range between the upper and lower adits is about 200 feet.

The vein, consisting of quartz, calcite, and hematite, is in Belt shales; it occurs along gently dipping bedding-plane faults and steeply dipping cross fractures. The strike is about north; the dip ranges from 30° to 85° E. Porphyritic rocks are exposed in the vicinity of the mine, but none are in evidence in the accessible upper adit.

The ore contains free gold and iron oxide in quartz. Some shipments contained a little lead and copper.

## Bourbon (Au, Cu)

The Bourbon patented claim is 14 miles west of White Sulphur Springs. It is owned by Russell Manger. One shipment of gold ore was made in 1922. The metal content is not known.

A white quartz vein in granite, ranging in width from 4 to 10 feet, strikes N. 30° E. and dips about 90°. The vein, being harder than the wall rock, has a prominent outcrop that can be traced for about 1 mile.

Two shafts were sunk on the vein, each to a depth of about 120 feet. Both shafts are caved. Some of the material on the dumps contains small amounts of copper carbonates and silicates.

## Victory (Meteor) (Mn)

The Victory manganese property, consisting of one unpatented mining claim, is owned by the Moore Ranch Co. of White Sulphur Springs, Mont. It is 22 miles northwest of White Sulphur Springs.

The property was operated in 1942 and 1943 by Archie Burns, of White Sulphur Springs, who shipped about 160 tons of ore averaging 29 percent manganese to the government stock pile at Butte, Mont.

The geologic formations exposed in the mine workings are beds of silty clay and argillaceous chert overlain by thin-bedded limestone (7). These formations strike north and dip about 4° W. Manganese occurs in lenses and bands in the argillaceous chert.

The primary manganese mineral appears to be braunite with opal and a little chalcedony; it is hard, vitreous, and contains an average of about 25 percent manganese (7). At the outcrop of the flat-lying, manganese-bearing chert beds, surface weathering has formed a residual deposit a few feet thick, in which the primary manganese mineral has altered to soft, porous psilomelane. Picked specimens of the psilomelane contain as much as 45 percent manganese.

The mine workings are open-cut, the overlying limestone and overburden having been removed from an area about 40 by 140 feet.

## Gold Placers

The source of the gold in the placer deposits along the northeastward-flowing creeks in the Beaver district apparently was the gold-bearing quartz veins and stringers near the headwaters of those creeks (4, 8). Most of these gold placer deposits were discovered and worked years ago. The increase in the price of gold in 1933 caused a revival of placer mining along some of these creeks.

Thompson Creek. - Gold was discovered in the gravels of this creek in 1865. Three companies were carrying on hydraulic mining here in 1868, and by 1870 it is estimated that their operations had produced about $50,000 worth of gold (4). From 1932 to 1940 the placers yielded 235.85 ounces of gold (15). Most of this was produced in 1939 and 1940 by a small dry-land dredge operation.

Camas Creek. - Camas Creek is a northward-flowing tributary that joins the Smith River about 2 miles north of Fort Logan. No information on early placering is available. Since 1933, placers along the creek have produced 87.53 ounces of gold (15). A gravel bench that extends from Fort Logan south for about 7 miles along the east side of Camas Creek and which in places is as much as half a mile wide was tested during the summer of 1947 as a possible site for a connected-bucket dredge (4). Results of the tests are not available. Evidence of old placer workings can be seen along the creek bed about 1 mile south of Fort Logan.

Atlanta Gulch. - Atlanta Gulch is a small tributary at the head of Camas Creek. Placers along the gulch have been worked intermittently by prospectors. E. Ogel and son operated a placer in the area in 1947 by bulldozing to a skid-mounted washing plant. Since 1932, the Atlanta Gulch placers have yielded 422.26 ounces of gold (15).

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Elk Creek. - Placer operations along Elk Creek, a tributary of Camas Creek, produced 4.97 ounces of gold during 1935 and 1936 (15). These placer deposits were worked in the early days, but no detailed information is available.

Thomas Creek. - Operations on Thomas Creek, about 5 miles west of Fort Logan, have been the largest producers of placer gold in the Beaver district in recent years. A dry-land dredge working on this creek recovered more placer gold than was produced from all other creeks in the county since 1904. Production figures for 1938 are not available, but the total recovery for the 3 subsequent years was 1,107 fine ounces (4). During 1940 and 1941, 835 ounces of gold was recovered from 128,000 yards of gravel treated by the dry-land dredge (15).

Benton Gulch. - Benton Gulch is just north, over the divide from Thomas Gulch. Placer claims along this creek were worked intermittently on a small scale until 1938, when a dry-land dredge was operated on one claim for about 2 months (4).

Beaver Creek. - Beaver Creek is an eastward-flowing tributary of Smith River. This creek, for which the district is named, has produced but little placer gold. Most of the placer mining has been done by small-scale sluicing and other methods (4).

## NONMETALLIC MINERAL OCCURRENCES

Nonmetallic mineral deposits in Meagher County have not been mined to any extent because of the lack of local markets and the cost of transporting the material to existing markets. Construction materials such as crushed rock and gravel have been mined for local use in road building and for concrete aggregate.

Numerous deposits of limestone occur in Meagher County; some are within 3 or 4 miles of a railroad. A lime kiln was operated near Castle in about 1900, but no lime is known to have been produced in the county in recent years.

Volcanic ash or tuff deposits occur at several places on the north slope of the Castle Mountains; they have been described by Weed (13) and Rowe (10). Tuff beds, ranging in thickness from 30 to 50 feet, are exposed along Checkerboard Creek. The material is brownish-red in color and faintly stratified; it is composed of fine, angular fragments of volcanic glass. Much of the lake-bed material near White Sulphur Springs and along the Smith River Valley is water-deposited volcanic ash.

No information is available as to utilization tests of volcanic ash from Meagher County. The analysis of the tuff from Checkerboard Creek made by Pirsson (13) follows:

| | Percent | | Percent |
|---|---|---|---|
| $SiO_2$ | 61.21 | $MgO$ | 1.58 |
| $TiO_2$ | .56 | $CaO$ | 2.18 |
| $Al_2O_3$ | 15.67 | $Na_2O$ | 1.57 |
| $Fe_2O_3$ | 4.06 | $K_2O$ | 2.75 |
| $FeO$ | .62 | $Li_2O$ | Trace |
| $MnO$ | .10 | $H_2O$ | 10.20 |

A large deposit of gypsum occurs in the northwestern part of the county, about 4 miles north of Lingshire, in secs. 9, 15, 16, 17, and 20, T. 13 N., R. 3 E. The deposit is 40 miles from White Sulphur Springs, the nearest railroad point.

The gypsum is in an area of gently rolling, grass-covered hills; it is usually covered by only a foot or two of red-soil overburden. The land surface is pitted with many "sink holes" where the surface has subsided into underlying solution cavities in the gypsum. The SE1/4 sec. 9, owned by Richard and Russell Manger, of White Sulphur Springs, has been explored by a few test shafts. One shaft 25 feet deep was entirely in gypsum and failed to penetrate the full thickness of the deposit. An exposure on the slope north of Freeman Creek in sec. 17, 1 mile south of the Manger property, is about 80 feet thick. Indication of bedding is almost entirely lacking, making it impossible to determine the attitude of the gypsum beds. The extent of the deposit has not been determined, but limited exposures and the widespread occurrence of "sink holes" indicate an area of about 2 square miles to be underlain with gypsum.

The chemical analysis of a Bureau of Mines sample of the gypsum exposed north of Freeman Creek and that of pure gypsum, in percent, are as follows:

| | Combined $H_2O$ | $SO_3$ | $CaO$ | $SiO_2$ | $Fe_2O_3$ | $MgO$ | $CO_2$ | NaCl |
|---|---|---|---|---|---|---|---|---|
| Gypsum, Freeman Creek.. | 20.0 | 46.1 | 32.2 | 0.01 | 0.02 | 0.20 | 0.26 | 0.002 |
| Pure gypsum............ | 20.9 | 46.6 | 32.5 | - | - | - | - | - |

## REFERENCES

1. Calderhead, J. H., and Benedict, L. P., Montana Bur. Agr., Labor, and Industry, 5th Ann. Rept., 1898, 188 pp.

2. Goodspeed, G. E., Iron Ore Deposits Adjacent to Belt Creek, Meagher County, Mont.: U. S. Geol. Survey Preliminary Rept., 1945, 8 pp.

3. Goodspeed, G. E., Iron Ore Deposits near White Sulphur Springs, Meagher County, Mont.: U. S. Geol. Survey Preliminary Rept., 1945, 15 pp.

4. Lyden, Charles J., Gold Placers of Montana: Montana Bur. Mines and Geology Mem. 26, 1948, pp. 95-98.

5. MacKnight, James Arthur, The Mines of Montana - Their History and Development to Date: C. K. Wells, Printers and Binders, Helena, Mont., 1892.

6. Neuschel, S. K., and Armstrong, F. C., The Alabama-Cleveland Manganese Mine, Meagher County, Mont.: U. S. Geol. Survey Memorandum Rept., 1944, 9 pp.

7. Neuschel, S. K., and Crittenden, Max D., The Victory Manganese Mine, Meagher County, Mont.: U. S. Geol. Survey Memorandum Rept., 1943, 4 pp.

8. Pardee, J. T., and Schrader, F. C., Metalliferous Deposits of the Greater Helena Mining Region, Montana: U. S. Geol. Survey Bull. 842, 1933, pp. 119-183.

9. Reed, Glenn C., Investigation of the Sheep Creek Iron Deposits, Meagher County, Mont.: Bureau of Mines Rept. of Investigation 4400, 1949.

10. Rowe, Jesse Perry, Some Volcanic Ash Beds of Montana: Mont. Univ. Bull. 17, Geol. ser. No. 1, 1903, 32 pp.

11. Sahinen, Uuno M., Mining Districts of Montana: Thesis submitted for the degree of Master of Science in Geological Engineering, Montana School of Mines, Butte, Mont., 1935, 109 pp.

12. Trauerman, Carl J., and Waldron, Cecil R., Directory of Montana Mining Properties: Montana Bur. Mines and Geol. Mem. 20, 1940, 135 pp. 29 pls.

13. Weed, Walter Harvey, and Pirsson, Louis V., Geology of the Castle Mountain District, Montana: U. S. Geol. Survey Bull. 139, 1896, 164 pp.

14. Weed, Walter Harvey, Description of the Little Belt Mountain Quadrangle, Montana: U. S. Geol. Survey, Geol. Atlas, Little Belt Mountains Folio No. 56, 1899, 9 pp. maps.

15. Compiled from U. S. Geol. Survey Mineral Resources, 1889 to 1923, U. S. Bureau of Mines Mineral Resources, 1924 to 1931, and U. S. Bureau of Mines Minerals Yearbooks, 1932 to 1946.

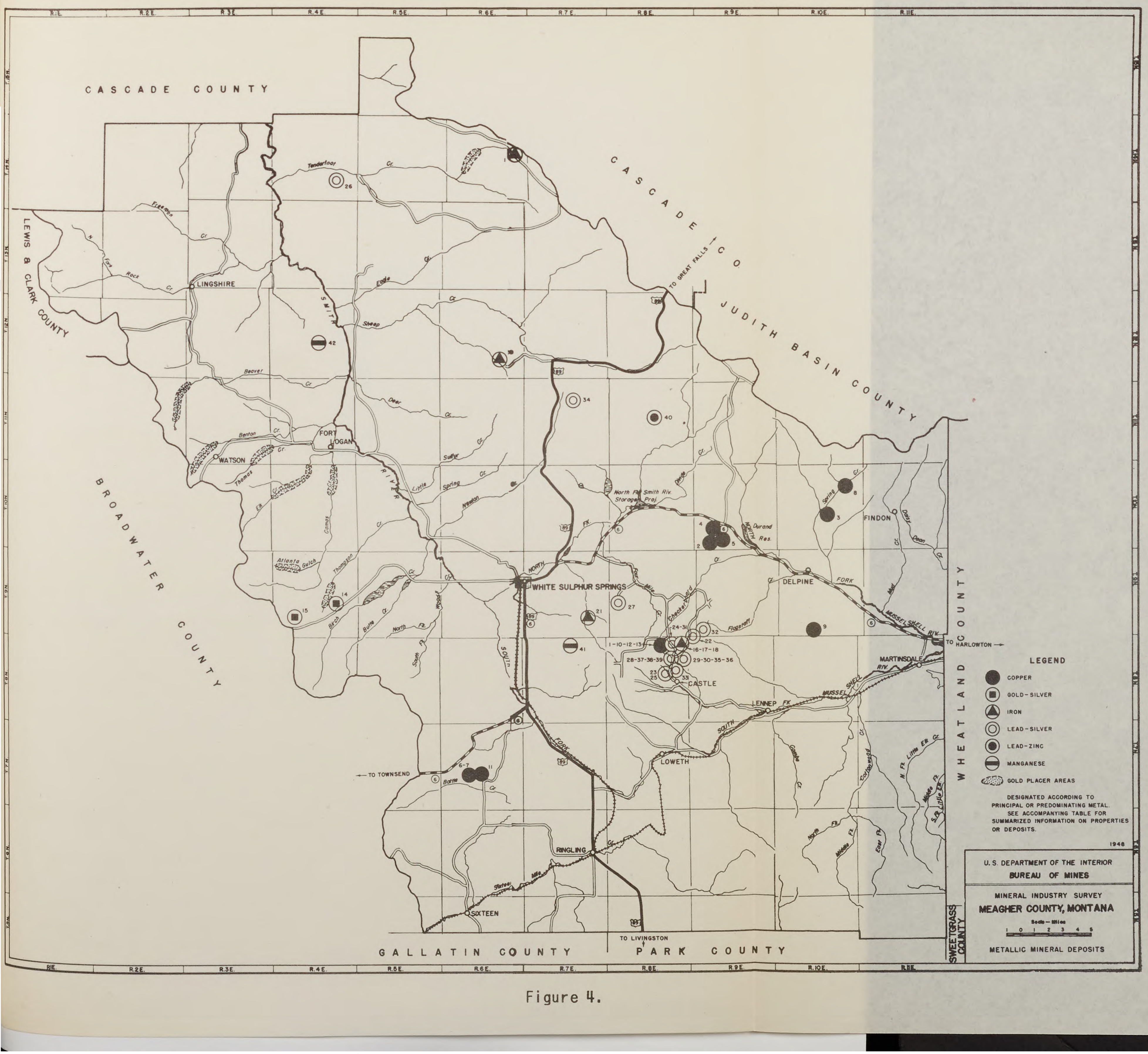
CASCADE COUNTY
CASCADE CO
JUDITH BASIN COUNTY
LEWIS & CLARK COUNTY
BROADWATER COUNTY
WHEATLAND COUNTY
GALLATIN COUNTY
PARK COUNTY
SWEETGRASS COUNTY
LINGSHIRE
FORT LOGAN
WATSON
WHITE SULPHUR SPRINGS
DELPINE
FINDON
MARTINSDALE
CASTLE
LENNEP
LOWETH
RINGLING
SIXTEEN
TO GREAT FALLS
TO HARLOWTON
TO TOWNSEND
TO LIVINGSTON
SMITH RIVER
NORTH FORK
SOUTH FORK
MUSSELSHELL RIV.
North Fk. Smith Riv. Storage Proj.
Durand Res.
LEGEND
COPPER
GOLD-SILVER
IRON
LEAD-SILVER
LEAD-ZINC
MANGANESE
GOLD PLACER AREAS
DESIGNATED ACCORDING TO PRINCIPAL OR PREDOMINATING METAL. SEE ACCOMPANYING TABLE FOR SUMMARIZED INFORMATION ON PROPERTIES OR DEPOSITS.
1946
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
MINERAL INDUSTRY SURVEY
MEAGHER COUNTY, MONTANA
Scale—Miles
1 0 1 2 3 4 5
METALLIC MINERAL DEPOSITS
R.1E. R.2E. R.3E. R.4E. R.5E. R.6E. R.7E. R.8E. R.9E. R.10E. R.11E.

Figure 4.

MINERAL INDUSTRY SURVEY TABLE
MEAGHER COUNTY, MONT. 1948
Metallic Mineral Deposits 1/

| Map ref. no. | Name of property or deposit 2/ | Location Sec. | T. | R. | ● - Copper<br>Description of deposit | Indicated metal content | Reported production | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Belle of the Castles | 2 | 8N. | 8E | Veins in quartz porphyry at or near Belt shale contact. Copper carbonate, chalcopyrite, and pyrite. | ? | Intermittent-small | Shaft and two adits - not accessible. Last production about 1939. |
| 2 | Calumet-Jamison & Hecla | 32 | 10N | 9E | Narrow quartz-calcite vein in shales, chalcopyrite and copper carbonates | ? | No record | Three shallow shafts now caved. |
| 3 | Clara Barton (Blue Bird) (Claraton) | 22 | 10N | 10E | Quartz-calcite vein in shales, 0.5 to 2 feet wide. Chalcopyrite, bornite, pyrite, a little sphalerite. | 10 to 15% Cu after sorting | Intermittent small shipments | 300-foot shaft - 3 levels - caved. Last mined in 1928. |
| 4 | Copperopolis | 19,20,28, 29,30,32 33 | 10N | 9E | Narrow fissure veins in argillaceous Belt shales. Chalcopyrite, bornite, pyrite, and copper carbonates. | 5 to 20% Cu | Small amount about 1867. Principal production in 1916-17 and 1922-23. | Two shafts - 500 ft. and 200 ft. Workings inaccessible. |
| 5 | Copper Duke | 32 | 10N | 9E | Narrow quartz-calcite vein in Belt shales, chalcopyrite and copper carbonates | ? | Shipments made in 1918 and 1919. | Extent of workings not known. |
| 6 | Copper Glance | 21 | 7N | 6E | Quartz-calcite vein in Belt shale. Chalcopyrite and copper carbonates. | ? | Small production in 1929-30. | Extent of workings not known. |
| 7 | Copper Queen | 21 | 7N | 6E | Quartz-calcite vein in Belt shale. Chalcopyrite and copper carbonates. | ? | One carload in 1923. | Extent of workings not known. |
| 8 | Jumbo & New Deal (Lucky Boy and Boss) | 11,12 | 10N | 10E | Quartz veins 1 to 7 feet wide in Belt shales. Chalcopyrite, bornite, pyrite. A little sphalerite. | 2 to 15% Cu | Sporadic small shipments. One carload in 1943. | Three shafts - flooded. 100 to 140 feet deep. |
| 9 | Montana Copper (Barnette) | 33 | 9N | 10E | Vein in Belt shales, 2 to 18 inches wide. Chalcopyrite, pyrite, some copper carbonates. | 10 to 15% Cu | 31 tons of 15.3% Cu ore in 1917. | Two adits - partly caved. Plans reported to deepen winze from upper adit. |
| 10 | Morning Star (Queen-Hensley) | 2 | 8N | 8E | Some chalcopyrite and pyrite, but mainly magnetite in replacement deposit at contact of shale and quartz porphyry dike. | ? | ? | One of the claims in the Queen-Hensley iron group. |
| 11 | Stewart & Battle Creek | 21 | 7N | 6E | Quartz-calcite vein in Belt shales, 3 to 4 feet wide, sparsely mineralized with chalcopyrite. | Low grade | Small tonnage about 1918. | One shaft about 100 ft. deep-inaccessible. |
| 12 | Top Lode (Tip Top, Copper Top) | 2 | 8N | 8E | Small replacement in Belt shales at or near quartz porphyry-shale contact. Chalcopyrite, a little galena, gold, and silver. | ? | Small production 1916-17. | One 160-foot shaft. All workings inaccessible. |
| 13 | Vandor | 2 | 8N | 8E | Deposits at or near contacts of Belt shale, quartz porphyry and limestone. Chalcopyrite and galena. | ? | Shipment of copper ore in 1917. Carload of Pb ore in 1919. | Extent of workings not known. |
|  |  |  |  |  | ⊡ - Gold-Silver |  |  |  |
| 14 | Bourbon | 23 | 9N | 4E | White quartz vein, 4 to 10 feet wide in quartz porphyry. Gold and small amount of chalcopyrite. Sparsely mineralized. Vein traced for over 1 mile. | ? | Only shipment reported was made in 1917. Tonnage and grade unknown. | Two shafts, 120 and 125 feet deep. Now inaccessible. |
| 15 | Snowbank (Jack Pine) (Beverly Hills, Porcupine) | 29 | 9N | 4E | Narrow gold-bearing vein of quartz, calcite and hematite along fractures and bedding plane faults in Belt shale. | - | 373 tons from 1932-40 averaged 0.72 oz. gold a ton. | Three adits 200, 400, and 700 feet. Upper 200-foot adit accessible. |
|  |  |  |  |  | ▲ - Iron |  |  |  |
| 16 | California & Hendricks (Also see Lead-Silver) | 1,12 | 8N | 8E | Contact metamorphic zone along limestone-quartz porphyry as at Iron Chief. No iron ore exposed. Iron ore reported in workings. | ? | Reported that small amount used as flux in Cumberland smelter. | One shaft reported 140 feet deep with 1,500 feet of workings on two levels. Now inaccessible. |
| 17 | Iron Chief (Also see Lead-Silver) | 1 | 8N | 8E | One outcrop of hard dense magnetite 60 feet long, 25 feet wide near limestone-quartz porphyry contact. | About 50% Fe | Small amount used as flux in Cumberland smelter. | No underground workings on iron deposit. |

3358

## MINERAL INDUSTRY SURVEY TABLE
## MEAGHER COUNTY, MONT. 1948
### Metallic Mineral Deposits 1/(Continued)

| Map ref. no. | Name of property or deposit 2/ | Location Sec. | T. | R. | ▲ - Iron (Contd) Description of deposit | Indicated metal content | Reported production | Remarks |
|---|---|---|---|---|---|---|---|---|
| 18 | Iron Mountain | 13 | 14N | 6E | Limonite and hematite in low dipping bed of Belt shales 10 to 20 feet thick. Traces of copper carbonates. | Selected - up to 59% Fe. Low S and P. | None | Altitude 7,450 ft. Nearest railroad 35 miles. Several trenches and shallow pits - caved. |
| 19 | Queen (Hensley) | 2 | 8N | 8E | Replacement in limestone along quartz porphyry contact. Magnetite with some chalcopyrite and pyrite outcrops in series of lenses ranging to 6 feet in thickness. | 53-61% Fe.<br>Trace-0.2% S of ore mined. | 2,000 tons to East Helena smelter as flux in 1902. | Two adits now caved. See also Morning Star, Cu No. 10. |
| 20 | Sheep Creek Iron | 26,34 | 12N | 6E | Steeply dipping fissure veins; hematite with minor limonite - 12 to 50 feet wide, ave. 38 feet. Bedded replacement veins; limonite and hematite as cemented breccia, 3 inches to 105 feet, ave. 16.6 feet. | 20 to 59% Fe<br>Ave. 31.7% Fe | None | In isolated area. Non-bessemer type. |
| 21 | Willow Creek Iron (Ringling) | 26 | 9N | 7E | Replacement along Madison limestone-granite contact. 125 feet long, 25 feet wide. Mined to depth of 50 feet. Principally magnetite. Some evidence of sulfides. | Sorted ore on dump<br>64.35% Fe<br>0.07% S | 5,000 tons shipped to East Helena as flux about 1920. | Ore mined by glory hole stoping from adit 50 ft. below outcrop. No ore mined from second adit about 150 feet below outcrop. |
| | | | | | ◎ - Lead-Silver | | | |
| 22 | Blackhawk & Alice | 6<br>36 | 8N<br>9N | 9E<br>8E | Replacement vein 4 ft. wide in limestone striking east and dipping 50° S. Galena, cerussite and $MnO_2$. | Ag reported at 5-15 oz. Pb unknown. | Small amount | Two shafts 130 and 185 feet. Inaccessible. Considerable Mn in vein at surface. B. M. sample assayed Au-0.01 oz., Ag-1.0 oz., Pb-3.2%, Mn-9.0%. |
| 23 | Broadway | 14 | 8N | 8E | Zone along limestone-granite contact; galena, cerussite and iron pyrite. | ? | No record | Shallow shaft and trenches. Probably on same contact zone as Cumberland mine. |
| 24 | California & Hendricks (Also see iron) | 1,12 | 8N | 8E | Small lead-silver replacement vein in limestone near quartz porphyry contact. | ? | No record | Several shallow shafts now caved. |
| 25 | Cumberland | 14 | 8N | 8E | Replacement in Madison limestone near granite contact. Reported to have been 7 to 75 feet wide. Chimney or pipe-shaped. Mined to depth of about 500 feet. Argentiferous galena and cerussite. | 20-60% Pb<br>12-27 oz. Ag | 18-20 million lb. of Pb and about 615,000 oz. Ag from ore mined 1888-93. | Was largest producer in Meagher County. One d.d. hole drilled in 1948. Plans reported to reopen shaft workings in 1949. Small production in 1943 by lessees. |
| 26 | Ducolon-Potter (Jenkins) | 26 | 14N | 4E | Steeply dipping quartz vein in limestone. 18 to 20 inches wide. Galena and copper carbonates. | ? | 8 tons lead ore about 1900. | Three short adits now caved. |
| 27 | Grasshopper | 19 | 9N | 8E | Small replacement in limestone. Small amounts of galena, cerussite, and $MnO_2$. | ? | ? | Caved shaft about 100 ft. deep. Dump shows Mn stained limestone. |
| 28 | Great Eastern - Great Western | 11,12 | 8N | 8E | Replacement deposit along contact of brecciated limestone and quartz porphyry. Galena and cerussite. | Selected specimens on dump 10-50% Pb. | 500 tons about 1888 | Three shafts 75, 150, and 300 feet deep, all caved. |
| 29 | Hidden Treasure | 1,12 | 8N | 8E | Lead-silver replacement deposit in limestone. $MnO_2$ and $Fe_2O_3$ with galena and cerussite. | ? | No record | Dump at caved shaft shows only quartz porphyry and shale. |
| 30 | Homestake | 12 | 8N | 8E | Small lead-silver replacement deposit in limestone. | ? | Small amount in 1925 | All workings caved. |
| 31 | Iron Chief (Also see iron) | 1 | 8N | 8E | Replacement vein near limestone quartz porphyry contact reported to contain high-grade argentiferous galena. | ? | No record | 250 ft. shaft now caved. Dump contains considerable iron pyrite but no lead ore in evidence. |
| 32 | Judge | 31 | 9N | 9E | Replacement in Cambrian limestone 8 inches to 4 feet wide and 20 feet long. Galena and cerussite. | ? | Small amount shipped to East Helena about 1897. | 230-foot shaft now caved. |

MINERAL INDUSTRY SURVEY TABLE
MEAGHER COUNTY, MONT. 1948
Metallic Mineral Deposits 1/(Continued)

| p<br>f.<br>. | Name of property or deposit 2/ | Location Sec. | T. | R. | ◎ - Lead-Silver (Contd)<br>Description of deposit | Indicated metal content | Reported production | Remarks |
|---|---|---|---|---|---|---|---|---|
| 3 | Jumbo | 11,12<br>13,14 | 8N | 8E | Replacement in Carboniferous limestone. Strike N. 12° E., Dip 80° E. Galena and cerussite. | - | Shipment in 1898 reported to have contained 65% Pb. | Old pits on vein or veins in distance of about 500 ft. Three shafts 40, 100, 150 feet - now inaccessible. |
| 4 | Lynn (High Tariff) | 10 | 11N | 7E | Replacement of bleached and altered quartz porphyry dike in thin-bedded shale. Galena, iron pyrite and arsenopyrite. | Sorted ore on dump 28.57 oz. Ag, 8.9% Pb. | Small amount. | Ore shoot indicated not over 25 feet long. Dike traced for about 600 feet. Workings caved. |
| 5 | Silver Spoon (Powderly) | 12 | 8N | 8E | Replacement in limestone. Strike N. 45° E., dip 58° SE. Galena and cerussite. | Selected ore on dump - 10-20% Pb. | Worked in 1888; no record of ore shipped. | Developed by adit about 50 ft. below outcrop. Adit portal now caved. |
| 6 | Silver Star | 12 | 8N | 8E | Replacement along fracture in limestone. Strike N. 45° W., dip 80° SW. Galena and cerussite. | ? | No record. | Workings caved and inaccessible. |
| 7 | Solid Silver | 11,12 | 8N | 8E | Replacement in limestone near quartz porphyry contact. Galena and cerussite. | ? | No record. | Workings caved and inaccessible. |
| 8 | Skidoo | 11 | 8N | 8E | Replacement in limestone. Galena and cerussite. | ? | Small amount in 1917. | Workings caved. |
| 9 | Yellowstone | 11 | 8N | 8E | Replacement along fractures in Madison limestone near quartz porphyry contact. Galena and cerussite. | Selected specimens on dump about 10-60% Pb. | A few thousand tons prior to 1900. Small shipments in 1917, 1926, and 1927. | 415-foot shaft now caved. One diamond-drill hole in 1948. |
|  |  |  |  |  | ◉ - Lead-Zinc |  |  |  |
| 0 | Copper State | 15,16<br>22 | 11N | 8E | Steeply dipping quartz-calcite vein cutting Belt shale. Marmatite with small amount of galena and chalcopyrite. | Sorted ore in bin 31% Zn, 5.9% Pb. | Small shipments made in 1927 and in 1937. No earlier records. | Main shaft 200 feet deep, now caved. |
|  |  |  |  |  | ⊖ - Manganese |  |  |  |
| 1 | Alabama-Cleveland (Manger Manganese) | 3 | 8N | 7E | Lenses of soft pyrolusite and wad with small amount of hard psilomelane along bedding plane faults in dolomitic limestone. | Soft ore 11-23% Mn. Hard ore 35-40% Mn. | Small amount reported in 1917 and in 1943. | Lenses 20 to 80 feet long, 3 to 4 feet wide. Only small amount of hard ore that can be sorted from clay and gouge. |
| 2 | Victory (Meteor) | 22 | 12N | 4E | Small lenses and bands of hard vitreous braunite (?) and opal in argillaceous chert beds. Weathering has produced shallow surface deposit of psilomelane. | Primary ore 25% Mn; Psilomelane 30-45% Mn. | 156 tons shipped in 1943 that averaged 29% Mn. | Ore mined from open cut. Shipping ore limited to small tonnage of secondary ore near surface. |

/ Classified according to principal or predominating metal.
Also known by name or names in parenthesis.

3358